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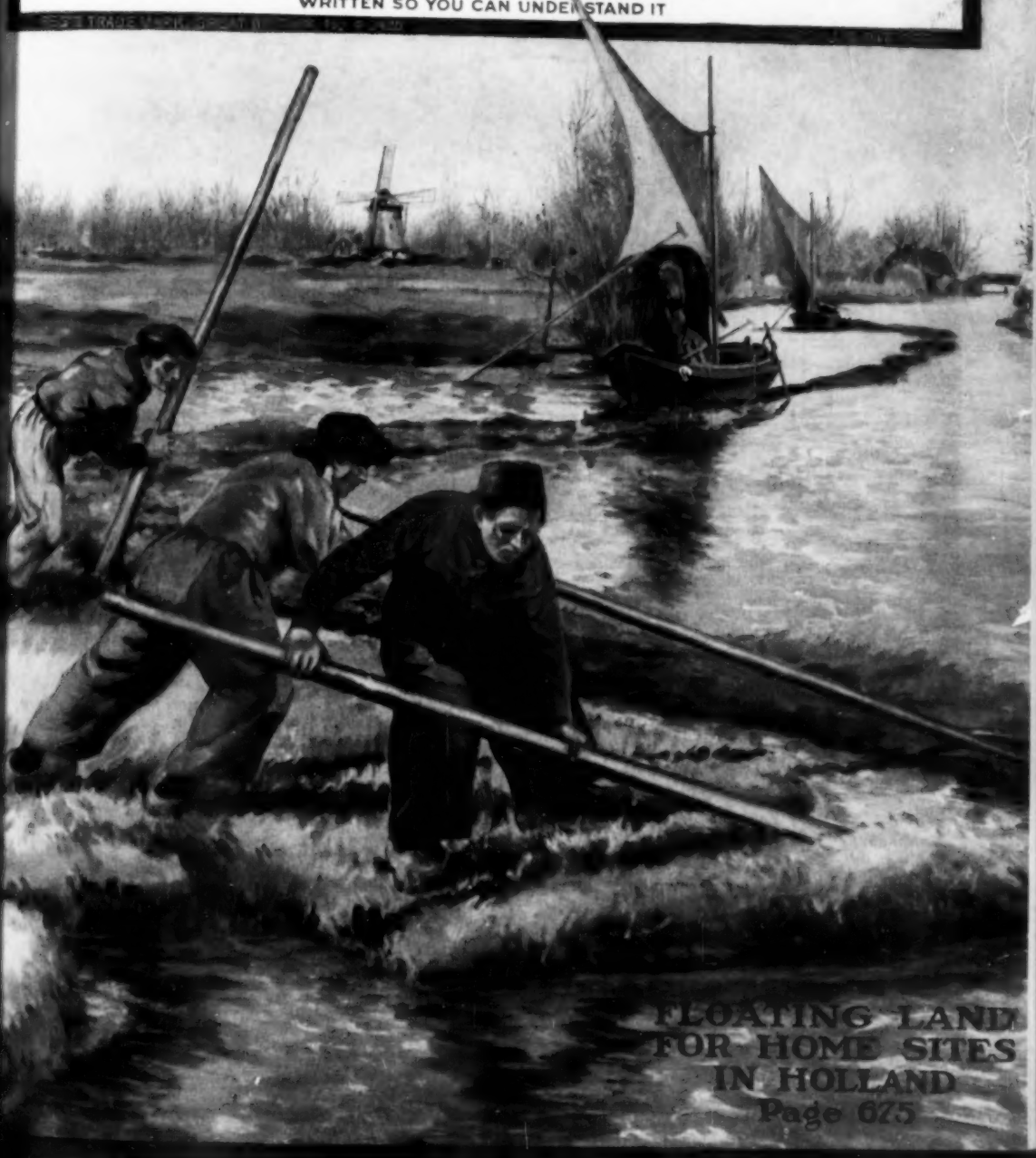

FLOATING LAND FOR HOME SITES IN HOLLAND

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THE SPORT TWIN

40 Pounds of Quiet Power

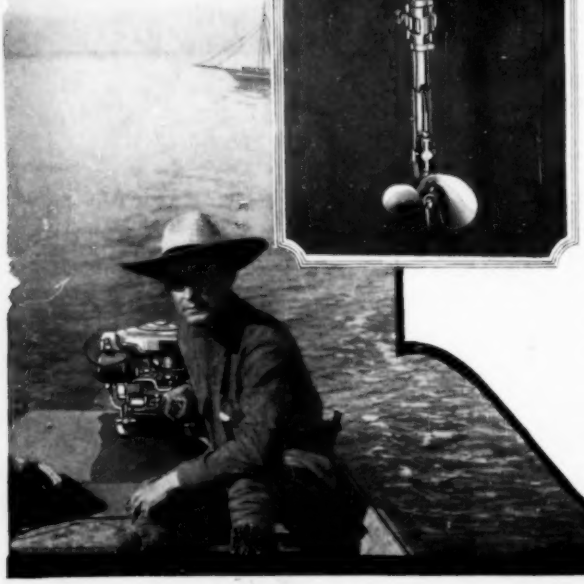
LIGHT, compact, sturdy, a "twin," and a genuine Evinrude! Look it over. Notice its clean, closely-knit design—its obvious ruggedness. And it performs even better than it looks.

The Sport Twin combines every feature you have wanted in a lightweight, two-cylinder, detachable motor. Instant starting — silent, vibrationless power—and typical Evinrude reliability.

Automatic Reverse and wide sweep of tiller give perfect control of boat and assure safety. Evinrude Tilt-up prevents damage by bottom or snags, makes beaching easy. Evinrude built-in-flywheel magneto, no batteries. Float-feed carburetor.

Ask your sporting goods or hardware dealer about the Sport Twin. Write for new catalog describing the complete Evinrude line of detachable and built-in motors.

Evinrude Motor Company
169 Evinrude Block, Milwaukee, Wis.



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Sport Twin
Big Twin
Standard Single
Built-in Evinrudes
One and two cylinder models

EVINRUDE

THOROPHONE

TRADE MARK REG.U.S.PAT.OFFICE

for Tone ~ Volume ~ Appearance

High Power Model

A. Heavy cast 16 oz. aluminum bell, dull black enamel finish, will not chip. Low periodicity. Non-vibrating.
B. Solid cast iron throat, correct acoustically; dull black enamel finish.
C. Powerful Violin-like, WOODEN tone arm. Amplifies, enriches, purifies the tone. Dark walnut, piano, hand-rubbed finish.
D. Wood cabinet, dark walnut, piano finish.
E. Vibrating solenoid coil.
F. Sound Ray Reproducer with controlled mica diaphragm. Much of the exquisite tone quality of the Thorophone is in this construction, which represents the highest development of the sound-reproducing art.
G. & I. Terminals for A Battery and Input with non-lose safety feature.*
H. Switch controlling A Battery for electro magnet, making it unnecessary to disconnect wires to A Battery.
J. Powerful three-coil electro magnet—the "powerhouse" of the Thorophone.
K. Rubber feet protect furniture upon which horn may be set.
L. Induction coil permitting a thousand volts of B Battery. You cannot injure the Thorophone by over-energizing.

* The height is 28 inches

The Worlds Greatest Loud~ Speaker

THE air is full of the most wonderful music—great artists, huge orchestra ensembles, famous bands. Are you receiving this marvelous entertainment with all the original beautiful shadings and with great or low volume to suit the occasion? The Thorophone with a good receiving set will do this for you.

The Thorophone combines perfect tone quality with great sensitiveness and powerful amplifying strength. Far distant stations—even foreign countries—have been brought in loud and clear over a Thorophone.

Its super-sensitiveness enables you to bring in stations you never heard before and to realize the full value of your receiving set.

It is manufactured and guaranteed by America's oldest manufacturer of loud-speaking telephones.

The WINKLER-REICHMANN CO., Chicago

Type - S-5

$45.00

S-6 consists of the Thorophone "S" type unit mounted on its side in a low, flat, beautifully finished wooden container.

It is arranged to lay on a phonograph and to connect to the phonograph horn.

It has a universal adapter, fitting all makes of phonographs.

The loud speaker is the same as in the S-6. This in combination with a good phonograph horn makes a most satisfactory outfit.

S - 6

$35.00

The mechanism of the Thorophone consists of a powerful electro-magnetic solenoid excited from your A battery. This solenoid operates a controlled mica diaphragm, thus combining great amplifying power and sensitiveness with perfect tone quality. The solenoid is built big and strong and requires no adjustment. The Thorophone is designed with a large factor of safety to withstand unusually strong radio currents.

The great amplifying power of the Thorophone has been proven over and over again on comparative tests. Tone reigns supreme in music. The Thorophone's rendition is perfect—the pure, clear tones grip you. You feel the living presence of the artist. The Thorophone is a great musical instrument, built for lovers of fine music.

MAIL THIS COUP ON TODAY

I am interested in the Thorophone.

My name is.....

Street.....

City.....

State of.....

Manufactured by
WINKLER-REICHMANN CO.
4801 S. Morgan St., Chicago, Illinois

Sales Department
THE ZINKE CO.
1323 S. Michigan Ave., Chicago, Illinois

Popular Mechanics Magazine

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Vol. 39 MAY, 1923 No. 5

Great Street may Cap Chicago River

BY ARTHUR ARROW, JR.

THE Chicago River, little used by boats, but because of its bridges at vital points a serious hindrance to traffic in that city, may soon be closed to navigation and its area utilized by building over it a great street, available for motor vehicles of all kinds.

The proposed plan, now in the hands of the Chicago Plan Commission and the Board of Local Improvements, calls for

The New Street will Start at the Michigan Avenue Bridge, Which Is the Lowest One in the Illustration, and Extend along the Main Branch of the River to Roosevelt Road. The North Branch, Which may be Seen Forking Off to the Right, will Go as Far as Division Street. At the Michigan Avenue Bridge, the Head of the Street, There will Stand Two Imposing Office Buildings, One of Which has Already been Built, While the Other is About to be Completed. Near Jackson Boulevard, the Farthest Point South Shown, the Artist has Pictured the New Union Station, Now being Constructed, and the New Federal Building. The Tall Spire toward the Middle Left Is That of the New First Methodist Church Building

a street 200 feet wide, built of concrete slabs on concrete piling about 4 feet above the water level, and extending from the Michigan Avenue bridge along the main river to Roosevelt Road, and up the north branch of the river to Division Street.

According to the plan, it is to pass under existing bridges, as well as any new ones to be constructed, all of which will have headroom sufficient for all vehicles. Sidewalks, 15 feet in width, will run the entire length of the new street, and there will be two driveways, 51 feet wide, each providing for traffic in one direction.

In the middle space, 68 feet wide, there is to be a municipal garage, extending from bridge to bridge, relieving the loop streets and alleys from such parking, and bringing to the city, by means of reasonable charges, a large revenue. Upon the roofs of the garages, it is proposed to have public parks, with gardens, benches, and fountains, thus beautifying the thoroughfare and affording an attractive breathing space for public use. The driveway itself will have no grade crossings, nor will pedestrians need to cross the street. All vehicles will turn into it or out of it with right-hand turns, joining the stream of traffic in the direction in which it is going.

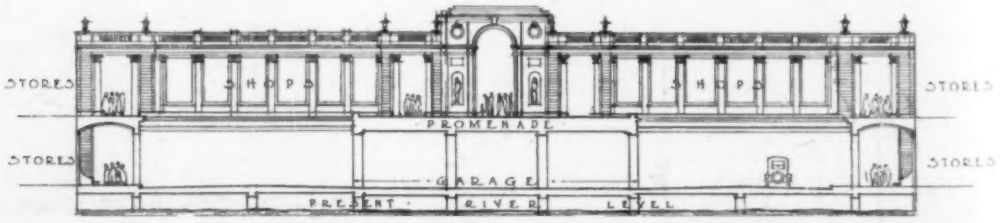
With the bridges fixed as permanent extensions of the streets they are connecting, it will be possible to erect on their sides attractive shops, such as may be found in Florence, Brussels, and other European cities.

Along the east and west sections of the river, the 200-foot stretch will not occupy the entire area, but space ranging from 50 to 90 feet will be added to the present dock line, and filled in for building purposes. Arcade streets, in the middle of all the blocks, leading to thoroughfares paralleling the driveway, will be another interesting feature.

Answering objections that the river is needed for lighterage and boat service, Angus Hibbard, of Chicago, the originator of the plan, states that experience has shown the coming of the automobile to have made lighterage uneconomical. In ordinary cases, he says, freight must first be unloaded from a car to a truck, then hauled to a river dock and transferred to a lighter. The lighter must then proceed to another dock, the load removed to another truck, and hauled to its destination. It is more economical to load such freight from car to truck and proceed directly to the destination, and this is the general practice. Even in cases where the destination points are immediately on the river bank, the lighter is not generally used as a means of conveyance. No one has gone into the lighterage business.

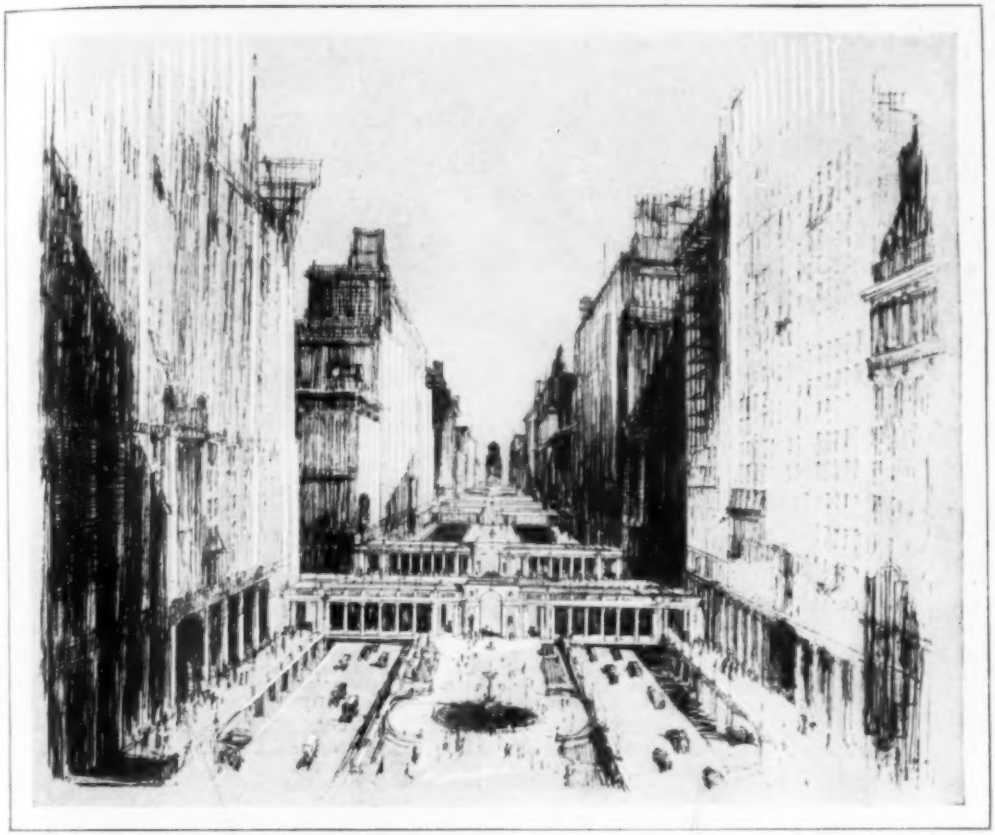
Among the many minor points involved, it may be mentioned that motor trucks loading with freight at near-by railway sidings, or warehouses, will be able to reach the new street at the nearest entrance, take their way along it, and then enter the loop at the point nearest their destination. A great part of the motor trucking would thus be taken out of loop streets which must now be used. Or again, the space now used for railway tracks, and for loading and unloading cars, might be disposed of at considerable profit. The cap will not in any way interfere with the utility of the proposed canal to the Mississippi River, as, by means of the Sag branch of the canal, boats would go directly to South Chicago harbor, where almost unlimited dockage is available.

All in all, the plan, claims Mr. Hibbard, will open up traffic lanes of great advantage to the city, will make the down-town district a more beautiful place to work in, and, incidentally will, in a direct way, help pay for itself.



Cross Section at One of the Bridges: The Distance from the Water Level to the Street will Be 4 Feet, and from the Street to the Roof of the Bridge About 14 Feet. The Sidewalks will Be 15 Feet Wide, the Driveways 51 Feet, and the Garage Space between Them, 68 Feet. Each Section will Be Large Enough to Accommodate 250 Cars

Meanwhile the river will flow on, carrying away the city sewage, at present its most useful function. This waste mat-



Vista of the Proposed Park and Driveway: On the Roof of the Municipal Garage There will Be Gardens, Fountains, and Benches, While Built about the Bridges will Be Stores and Shops

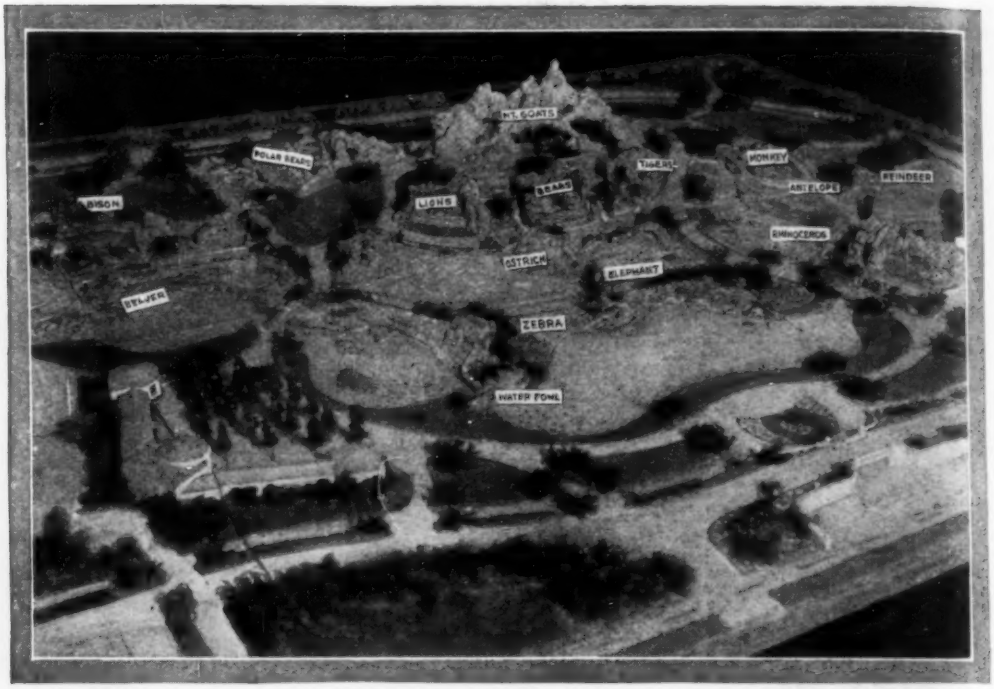
ter is carried to a drainage canal southwest of the loop, which in turn empties into the Illinois River.

It is estimated that the improvement, if adopted, will cost approximately $2,500,000 per mile.

LICENSE PLATES REQUIRED FOR DENVER CYCLISTS

Since the passage of an ordinance by the Denver city council requiring all bicycles to carry license plates, the police department has been busy attaching plates to the bicycles of owners who are eager to take advantage of this protection against thieving. The license costs but $1 a year. All police officers are instructed to look out for bicycles without plates, and secondhand dealers must report the license numbers of wheels for sale.

Cyclists of Denver, Gathered at Police Station, to have License Tags Affixed to Their Wheels: The Measure was Ordered for Protection against Theft



The Model Gives an Excellent Idea of How the New Cook County Zoo will Look When Completed. In the Building to the Left There will Be Refreshment Counters, and in the Court, Tables from Which the Visitors will Have an Unobstructed View of the Numerous Animal "Cages"

CAGING ANIMALS IN MODERN ZOOS

BY HJALMER LINDQUIST

HOWEVER well satisfied captive wild animals may be in a zoölogical cage, there are always sentimental persons who find cause to pity the beasts and censure those public officials they think responsible for this seemingly cruel confinement. The provocation for such criticism can be traced in most instances to the cage. The zoo cage is exhibited more than the animals in it. There is too much evidence of the prison, and not enough of the frolicsomeness of the animals.

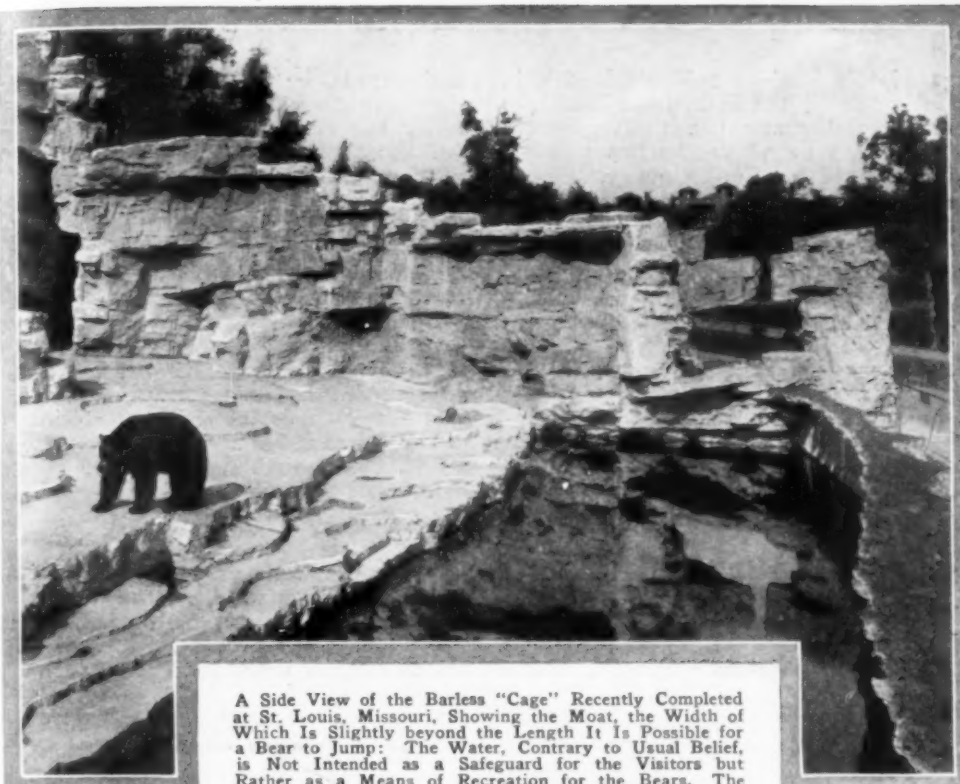
The solution of the problem has been found in not only making the home of the animals more agreeable, but also in having the cage in appearance proclaim this quality to everyone who sees it. Thus, in the latest practice, all bars are done away with, and the animals are placed in a habitat such as they might well choose for themselves. Then pity for the beasts vanishes and real enjoyment is found in observing them.

Perhaps the latest, and certainly one of the finest examples of a barless "cage," is now being completed at St. Louis, Mo. Though not radically different from similar cages in Denver and in some foreign cities, it has incorporated in it many little refinements that place it in a class by itself. The barless cage, as is quite generally known, consists of a three-sided arrangement of rock with a wide moat in front. The sides, of course, are so built that it is impossible for the animal to climb over or jump from them, while the moat is equally impassable.

In making the rock background for the St. Louis cage, which, by the way, was made to exhibit bears, the forms were first copied in glue molds from natural limestone ledge rock along the Mississippi River. These were then made into plaster molds, fitted together, and supported to form the wall design facing the interior of the dens. Finally plain and colored mortar was sprayed upon the forms, and the surface brushed over with muriatic acid.

Behind the back wall of the den is a feeding room extending the full width. It is entered by the bears through openings left in the back wall, the keepers using a special passageway also built in concrete. If desired, the animals may be separated in this room by a series of gates which are ordinarily left open. Underneath are mating rooms, and rooms for the mother bear to rear her young.

One of the most ambitious undertak-



A Side View of the Barless "Cage" Recently Completed at St. Louis, Missouri, Showing the Moat, the Width of Which Is Slightly beyond the Length It Is Possible for a Bear to Jump: The Water, Contrary to Usual Belief, is Not Intended as a Safeguard for the Visitors but Rather as a Means of Recreation for the Bears. The Barrier, of Course, would Be Equally Effective without Any Water. Below Is a General View of the Den, Showing How the Scene Appears to the Spectators. Openings in the Rock, Which may be Observed at the Right, Lead to Feeding Chambers, and Other Special Quarters for the Animals

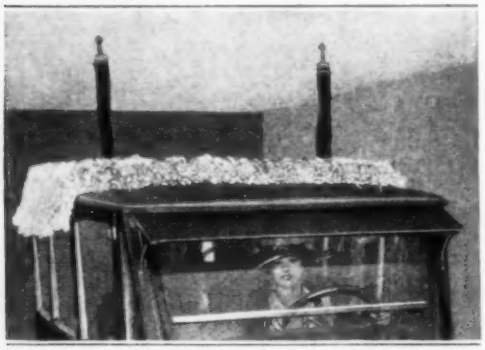
ings of this kind—a zoölogical park in which not only the bear den but all the other animal quarters, with few exceptions, are to be of the barless type—is being planned for Cook County, Illinois. The county owns a tract of forest land a short distance from Chicago, and it is there that the new zoo is to be built. If present plans are adopted, and it seems that this is likely, the county will have a zoölogical park distinctly different from any other in America.

From the entrance the visitor will see stretched before him a natural panorama of hill, rock, stream, and forest—all inhabited by wild beasts, and seemingly unconfined. Off toward his left will be zebra, and ostrich, and polar bear. Then as he turns, he will see the lions, bears, tigers, antelope, monkeys, and other animals. Perched on a rocky mound, some 200 feet above the level of the surrounding land, and about in the center of the park (which will be about a mile long, and a half mile wide), will be the mountain goats. How utterly unlike anything America has today!

Not even the spectators will be seen, for while walks are to be arranged so that visitors may come within close distance of the animals, they will not be visible from the main entrance. It seems that a new era is about to be ushered in, in zoölogical work, and that America, not always among the first in this field, is now to take its place as the leader.

HANGING DUSTER CLEANS AUTO TOP IN GARAGE

Hanging from the ceiling of the home garage, a new duster automatically cleans



Auto-Top Duster, Hanging from Ceiling of Garage, Automatically Cleans Top of the Car as It Enters and Leaves

off the top of the car every time it enters or is driven out. It is made of a soft woolly material, and hangs at such a distance from the ceiling that it brushes the top as the car passes under it. Proper attention to the top of an automobile is often neglected because, without a special device such as this, it is difficult to get at it.

GOVERNMENT PLANES TO AID RED-CROSS RELIEF

Air craft of the army and navy and the Post Office Department will coöperate in the future with the American Red Cross to the extent of being available for the speedy transportation of disaster-relief personnel. Although completion of the arrangements for this purpose have only recently been announced, the War Department has already notified the Red Cross officials that airplanes would be placed at their disposal to carry such aid to the scene of any disaster, upon telegraphic request from a duly authorized Red Cross agent.

TRAP DRUMMER'S CASE HAS SPACE FOR ACCESSORIES

A newly designed musical-instrument case is made for the use of a trap drummer and contains space for his drum and its accessories, as well as for sheet music and a uniform. Made of a chemically treated fabric, it is said to be strong and durable. Fiber disks fit over the cymbals to hold them in place, and a tray holds the uniform. The cases are made in sizes for drums from 13 to 15 inches in diameter.

Trapdrum Case Containing Drum, Cymbals, Sheet Music, and the Drummer's Uniform, Which Fits into a Tray over the Drum

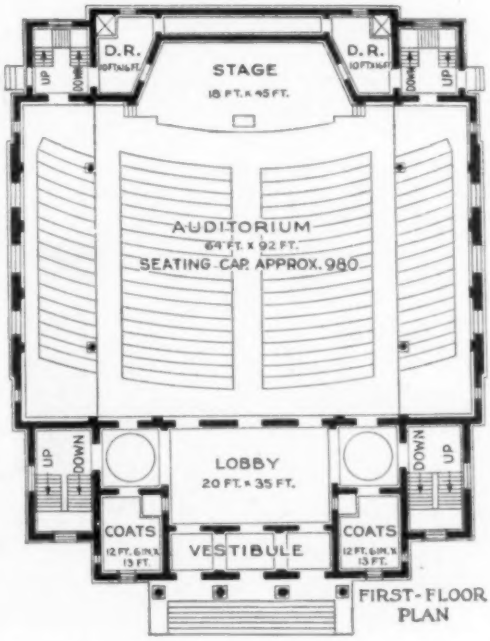
Front Elevation and Entrance to the Nonsectarian Church Which will Soon be Opened at Wellesley Hills, Massachusetts, as the Gift of a Local Resident: On the Church Platform will Be a Radiophone Receiving Set, and Distributed about the Auditorium will Be 100 Earphones

NEW CHURCH TO RECEIVE SERVICES VIA RADIO

By F. N. HOLLINGSWORTH

THE first wireless nonsectarian church in the country will soon be opened at Wellesley Hills, Mass., the gift of Roger W. Babson, a well-known statistician. In this church the usual radio Sunday services will be reversed. That is, instead of the service being broadcast from it, as in the case of St. Paul's Cathedral and other churches near Boston, services will be broadcast to it, either from other churches or by special arrangement.

On the church platform will be a radiophone receiving set, and out of its loud speaker will come the prayer, music, sermon, and other transmissible features of the regular church service. As it is planned to conduct services for several different denominations, this will, of course, necessitate a workable schedule. For example, at 8:30 a. m. there may be a sermon for Catholics, sent very likely from Schenectady or New York; at 9:30 there will be a service for Baptists broadcast from President Harding's church



Plan of the Main Auditorium and Stage of the New Radio Church, to be Finished in June: The Seating Capacity will Be 980. There will Be No Pulpit

Side Elevation of the Church: On Sundays, Services via Radio will be Held First for Catholics, Then for Baptists, Congregationalists, and Christian Scientists, in the Order Named

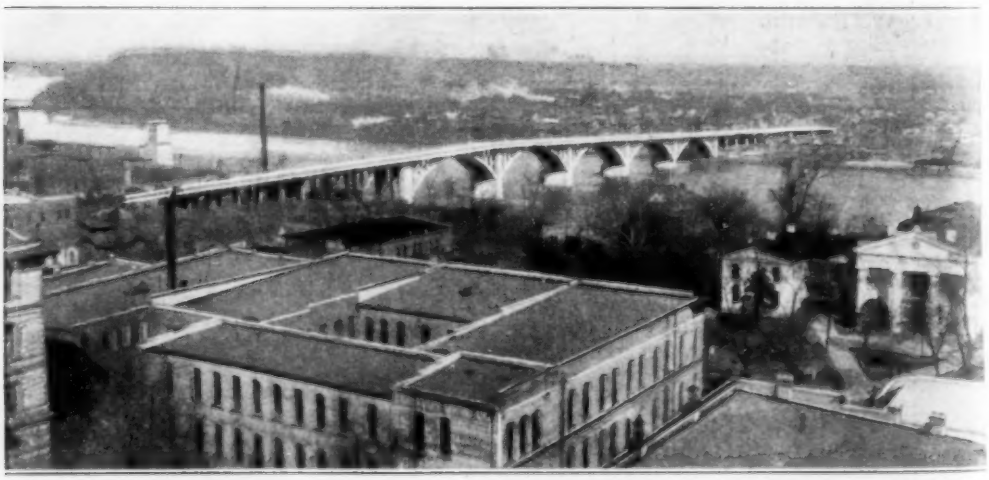
at Washington; at 11:30 a service for Congregationalists; and at 12:30 a service for Christian Scientists. It is thought that this arrangement will help solve the difficulties of the rural church, and that it will be a new power for good.

Collections taken up at the several denominational gatherings will go to the denomination holding that service.

¶A proclamation by the president has established the Pueblo ruin, near Aztec, N. M., presented to the government by the American Museum of Natural History, as a national monument.

ARKANSAS RIVER BRIDGE TO BE WAR MEMORIAL

The completion of a five-span concrete-arch bridge over the Arkansas River at Little Rock, marks all but the final step which the Bear State is taking to honor the memory of its sons who fell during the war. Final tribute will be paid shortly, when the splendid structure, almost 3,000 feet long, will be dedicated as a war memorial, with fitting ceremony. The bridge will serve as one of the most modern traffic spans in the country, and will carry a 60-foot roadway across the river between Little Rock and North Little Rock. In addition to vehicular traffic, provision is made for two lines of street-car tracks, and pedestrians will be amply accommodated with two 10-foot walks, one on each side. Long land approaches on each bank form part of the bridge proper, the river crossing being made by arches only, each having a span of 202¾ feet.



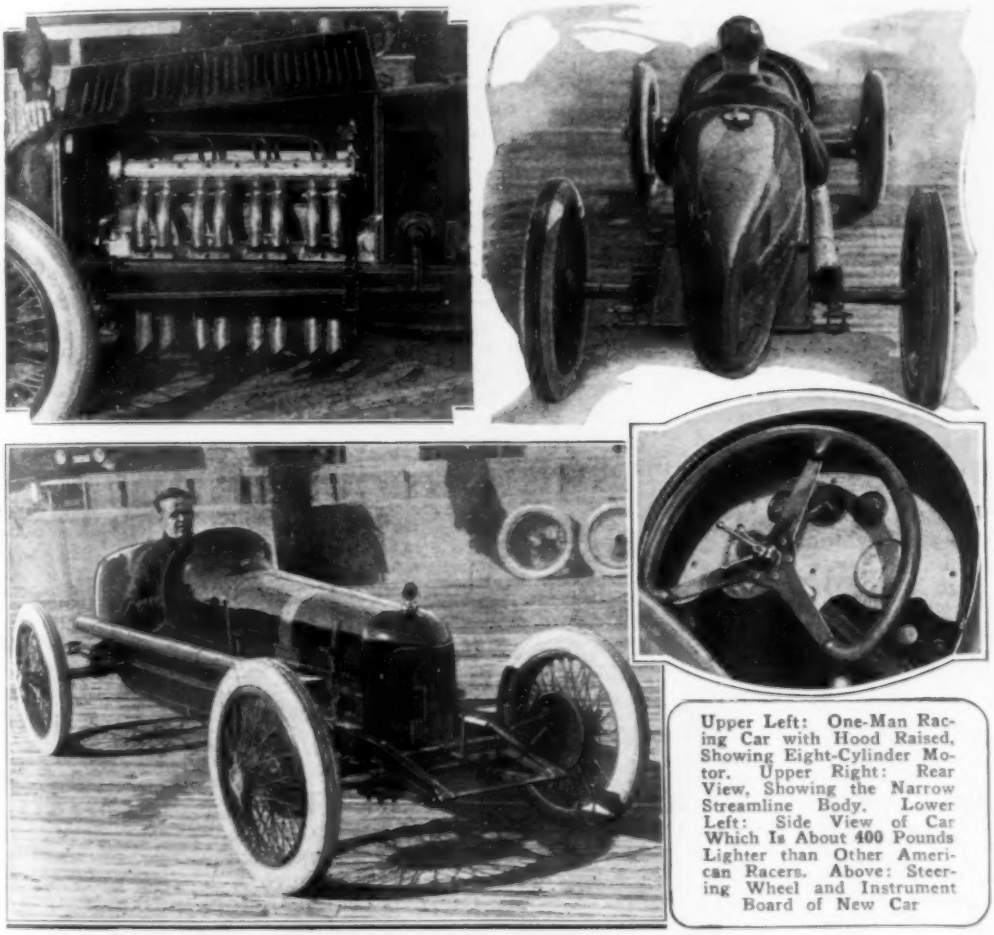
A Bird's-Eye View of the New Concrete-Arch Bridge Thrown across the Arkansas River at Little Rock: This Structure was Built to Commemorate the Soldiers, Sailors, and Marines Who Died during the War. Five Arches Span the River, with Long Approaches on Each Bank

BONFIRE SIGNALS TO TELL OF AMUNDSEN'S START

When Amundsen, the explorer, hops off on his flight across the North Pole, on or about June 20, a system of signal fires or smudges will carry the news of his start from Wainwright to the nearest radio station, some 400 miles away. From the radio station the word will be sent to the scout planes at Spitzbergen, which are to be on the lookout to render any possible assistance on his arrival. It is expected that the bonfire signals arranged will convey the news in a few hours. Even if the weather or other agencies interfere with some of the signals, it is believed that the Eskimos in charge will be able to make connections by runners, and that thus the message will be completed on schedule without difficulty.

FIRST ONE-MAN RACING CAR READY FOR SPEEDWAY

The first American one-man racing car has been completed, and it is predicted that the mechanician, who has always been the second member of the racing crew, will soon make his farewell bow to the public. This new car, which is about 400 pounds lighter than other American racers, has a piston displacement of only 122 cubic inches, is 4 inches shorter, and 4 inches narrower than usual. A polished steel mirror will give the driver a view of things at the side and in the rear. The body is constructed along airplane lines, and, although no attempt was made to force it, the car made 110 miles an hour in a recent trial. This is only another step in the tendency of recent years, to develop high-speed cars of low weight with small motors.



Upper Left: One-Man Racing Car with Hood Raised, Showing Eight-Cylinder Motor. Upper Right: Rear View, Showing the Narrow Streamline Body. Lower Left: Side View of Car Which Is About 400 Pounds Lighter than Other American Racers. Above: Steering Wheel and Instrument Board of New Car

WOOD-WASTE BRIQUETTES AS GOOD AS ANTHRACITE

BY LAWRENCE WM. PEDROSE

CARBONIZATION and briquetting of sawdust and other waste wood material from lumber mills and woodworking plants is an important new industry developed in the Pacific Northwest through experiments financed by leading lumber manufacturers of the district. The product is a fuel high in fixed carbon, low in volatile constituents and ash, and equal to Pennsylvania anthracite, making it ideal for domestic, industrial, and metallurgical purposes.

How profitably to utilize wood waste has long been a problem confronting lumber manufacturers. From data gathered from Pacific-coast mills, it has been ascertained that a mill cutting 200,000 board feet of lumber daily has 200 cords of waste after its own fuel requirements have been taken care of. In the larger cities and industrial districts part of this waste is utilized as hogged (chip) fuel or as firewood, but the cost of distribution is so great that the average mill operator cannot afford to engage in the fuel business, and usually sells the waste to fuel dealers at a very low price to get it out of the way.

Fuel Briquettes, Like This, Made from Wood Waste, are Said to Equal Anthracite

The lumber mills of the states of Washington and Oregon alone cut approximately 9,000,000,000 board feet of lumber annually, which means approximately 9,000,000 cords of wood waste, based upon a conservative estimate of one cord of wood waste to every thousand board feet of lumber. Hence it will be seen that utilization, in a practical way, of this waste is of great economic importance.

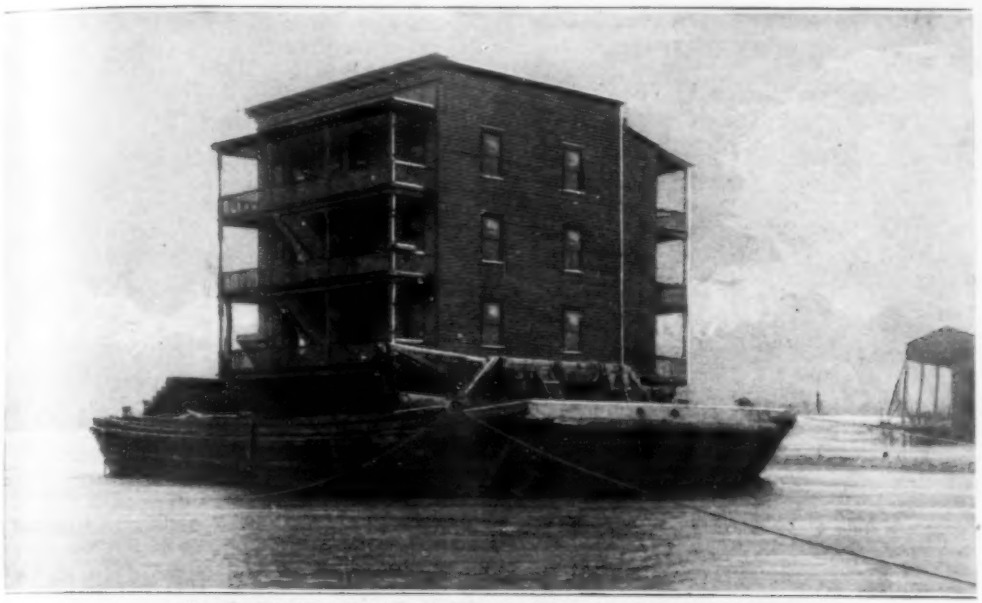
Experiments in the carbonization and briquetting of wood waste were made recently at Centralia, Wash. It was found that carbon briquettes could be successfully produced from waste wood at a cost of $8 a ton, constituting a fuel equal to the best anthracite coal in every way. The process of manufacture is not intricate, and the plant is self-contained in that the material used for binder is obtained from the waste wood itself.

Hogged wood is run through a rotary drier, where a part of the moisture is removed, and conveyed to retorts. In the retorts the material is carbonized; it is then ground through a cage grinder, conditioned by a formula on which patents are pending, put through a secondary grinding process, passed into a mixer and combined with the binder, again conditioned, and then pressed into briquettes ready for the secondary retort. In the secondary retort the lighter oils of the binder are recovered, leaving the active elements with a physical structure sufficient to withstand any condition that might arise while the briquettes are being consumed, and forming a sootless, smokeless fuel.

Investigation by a competent staff of engineers has shown that a 60-ton per day plant of finished briquettes, which would require approximately 150 cords of wood waste per day, can be operated profitably by a mill cutting 200,000 board feet of lumber a day and would absorb the surplus waste after the mill's own fuel requirements were taken care of. The cost of such a plant at the present time is about $150,000. This plant will produce 20,000 tons of briquettes annually at a cost of $8 a ton. It has also been found that from each ton of briquettes there can be obtained 15 gallons of tar oil, valued at $3; 30,000 cubic feet of gas, valued at $6, and seven gallons of acetone alcohol, valued at $5.25, or a total valuation of $14.25.

Because of their structural strength and the absence of any injurious impurities, the carbon briquettes are declared ideal for the smelting of ores. During the experiments, special tests were made to demonstrate these qualities. At an additional cost of 25 cents per ton, briquettes were produced having a compression strength of 650 pounds per square inch. Since a strength of 300 pounds per square inch is ample to resist the load in a 90-foot blast furnace, the importance of the new briquettes as a metallurgical fuel is readily seen.

¶ Street cars equipped with roller bearings are soon to appear in St. Paul and Minneapolis, and it is expected this departure will make the operation of the cars almost as noiseless as eight-cylinder automobiles. In addition it is believed 12 to 15 per cent on power will be saved and service speeded up.

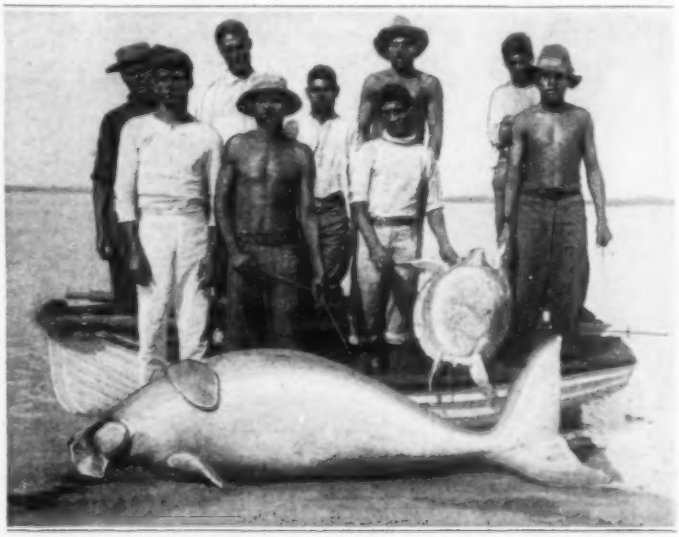


LARGE WOOD HOUSE "SAILS" LONG ISLAND ON BARGE

SPRING moving of a rather unusual nature was undertaken at Stamford, Conn., recently, when a large wooden three-story house was mounted on a barge, hauled out to Long Island Sound, and brought to a new location north of Shippan Point. Aside from certain obvious difficulties, the greatest trouble was encountered in transferring the house to the barge with the changing tide raising and lowering the water several feet—and in fighting a five-mile breeze on the sound.

DUGONG FISHING IN AUSTRALIA

The Australian land fauna is noted for its many exclusive specimens, but even the surrounding sea offers some queer animals unknown in most other waters. Of these, the dugong, also known as the sea cow, but not to be confused with the animal of northern latitudes also so designated, is one. While it is found elsewhere around the Indian Ocean, it is caught mainly in the waters of Northern Australia, and the fishing, though done on a small scale only and by hired native fishermen, gives good returns to the few Australians who have taken up the industry. The dugong is a warm-blooded mammal, and its flesh is much appreciated for its fine flavor, in which there is no suspicion of fishiness. Salted and smoked, the meat serves as an equally palatable bacon, and the "blubber" gives an excellent oil or lard with all the virtues of cod-liver oil. In addition the hide makes a good leather.



Australian Fishermen with Their Catch of a Large Dugong, a Warm-Blooded Mammal Inhabiting the Waters around Australia and Some Parts of the Indian Ocean: Dugong Fishing Is an Industry Still Little Developed

MICHIGAN NOW HAS ITS OWN REINDEER HERD

Will reindeer thrive in Michigan?

State game officials are making a very practical test in order that they may answer this question to their complete satisfaction. On an immense tract of cut-over land, near the city of Grayling, in Roscommon County, is a herd of reindeer imported several months ago direct from Norway, as recorded at the time in this magazine. Extreme care was taken in shipping the animals. Each had a crate to itself, and as a result not a single one of the entire shipment was lost in transit. What is more, the original herd of 60 has made a remarkable increase, and, at present, counts 81 head.

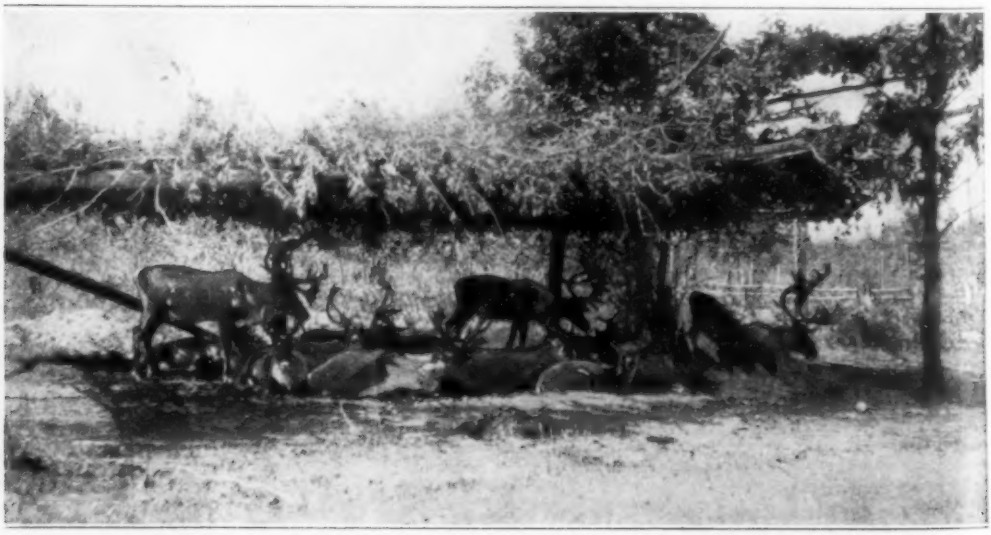
Close-Up of a Specimen of Norway Reindeer, Imported from That Country by the State of Michigan: Both Male and Female Reindeer Have Antlers of Great Spread

Upper Michigan has tens of thousands of acres of cut-over land that is lying practically idle. Many settlers have attempted to raise sheep here or tried to farm the land, but have failed. Stockmen have had to face the fact that, for several months, the ground is covered with snow. Their winter feed bills have been so high that scarcely any profit could be realized.

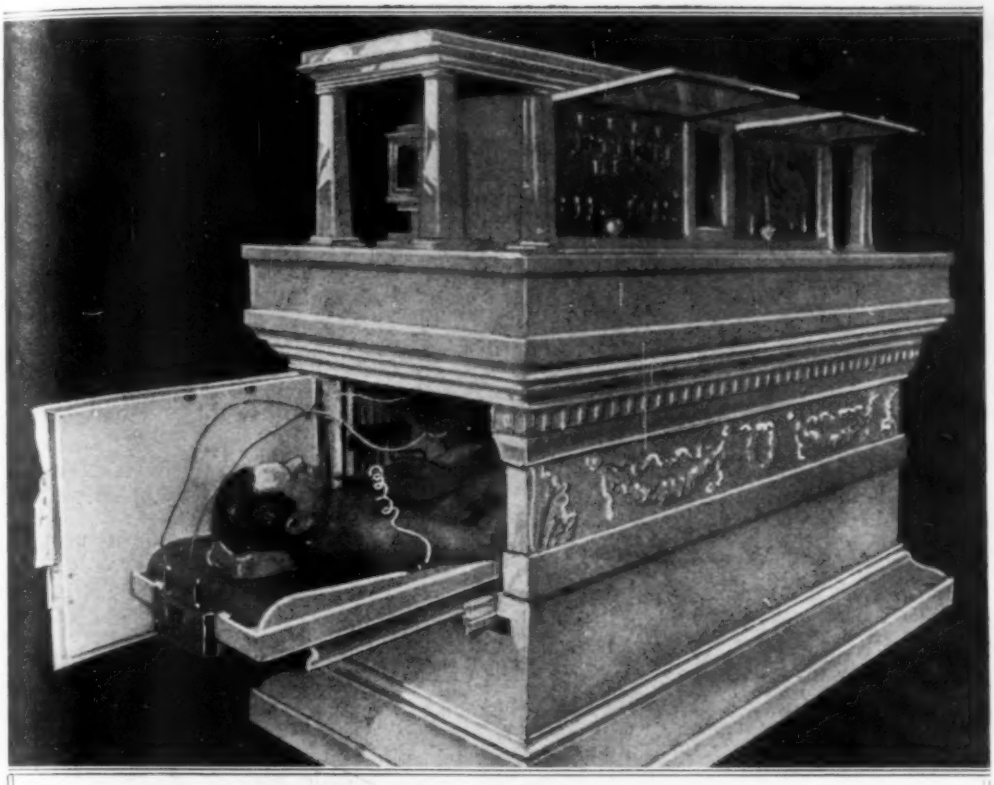
Then the State Board of Conservation came along and said, "Surely there must be some way to make these lands profitable throughout the whole year. There seems to be no good reason why the grasses and wild forage crops of our northern peninsula would not raise to healthy maturity any game animal."

It was this belief that led the state to buy the herd of 60 reindeer, 10 male and 50 female, from Norway, at a price of $125 each. The reindeer have an average weight of about 250 pounds, which means about 180 pounds when the animal is dressed.

The herd is to be placed on a 62,000-acre tract of cut-over land bordering the south shore of Lake Superior.



A Herd of Reindeer, Recently Imported, Making Themselves at Home on a 62,000-Acre Tract in Northern Michigan: They Are under State Control, and the Experiment is being Watched with Interest on Account of the Solution It Affords in Putting to Use the Great Waste Lands of the Upper Peninsula

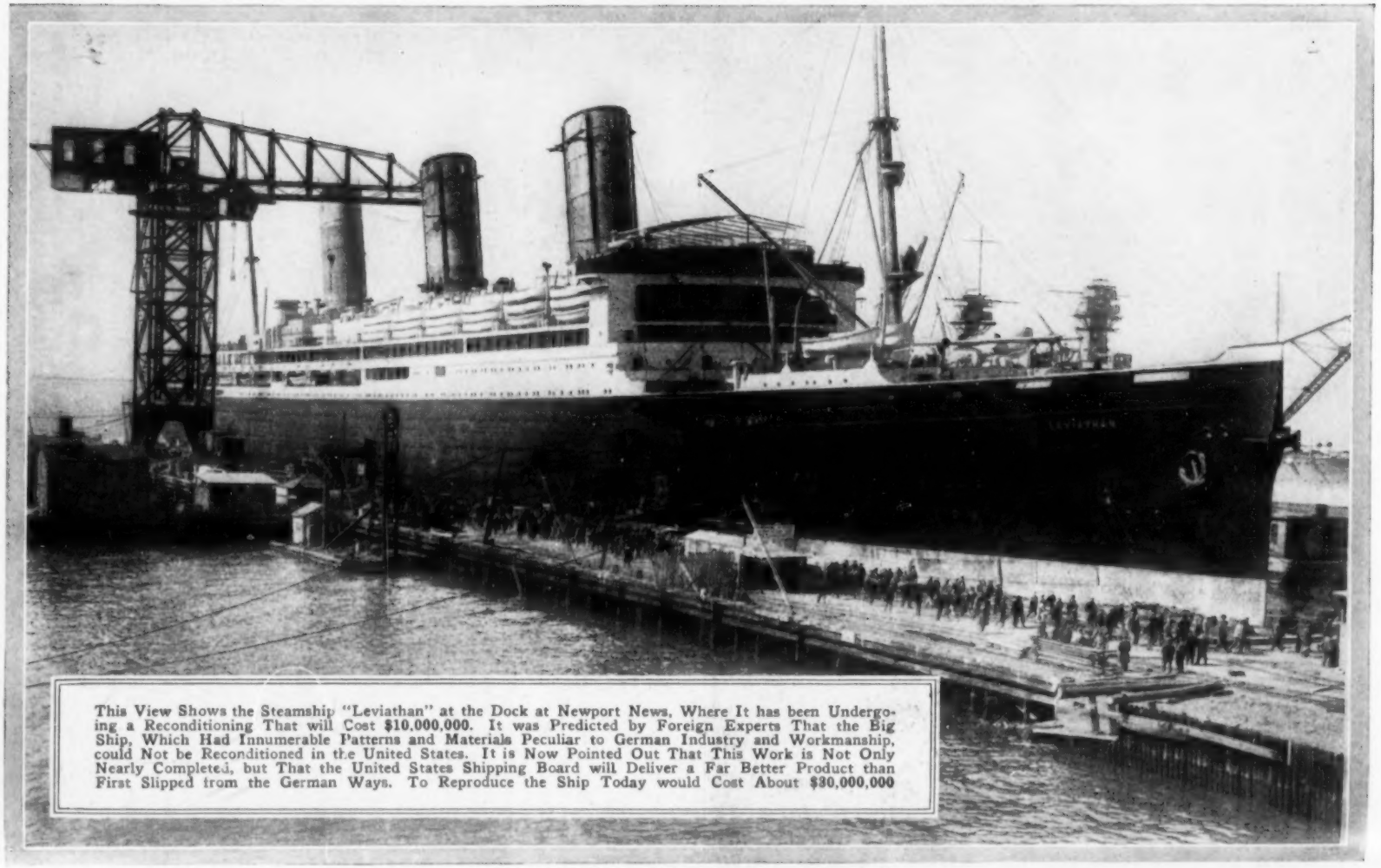


ELECTRIC MUMMIFICATION

By R. C. FOLGER

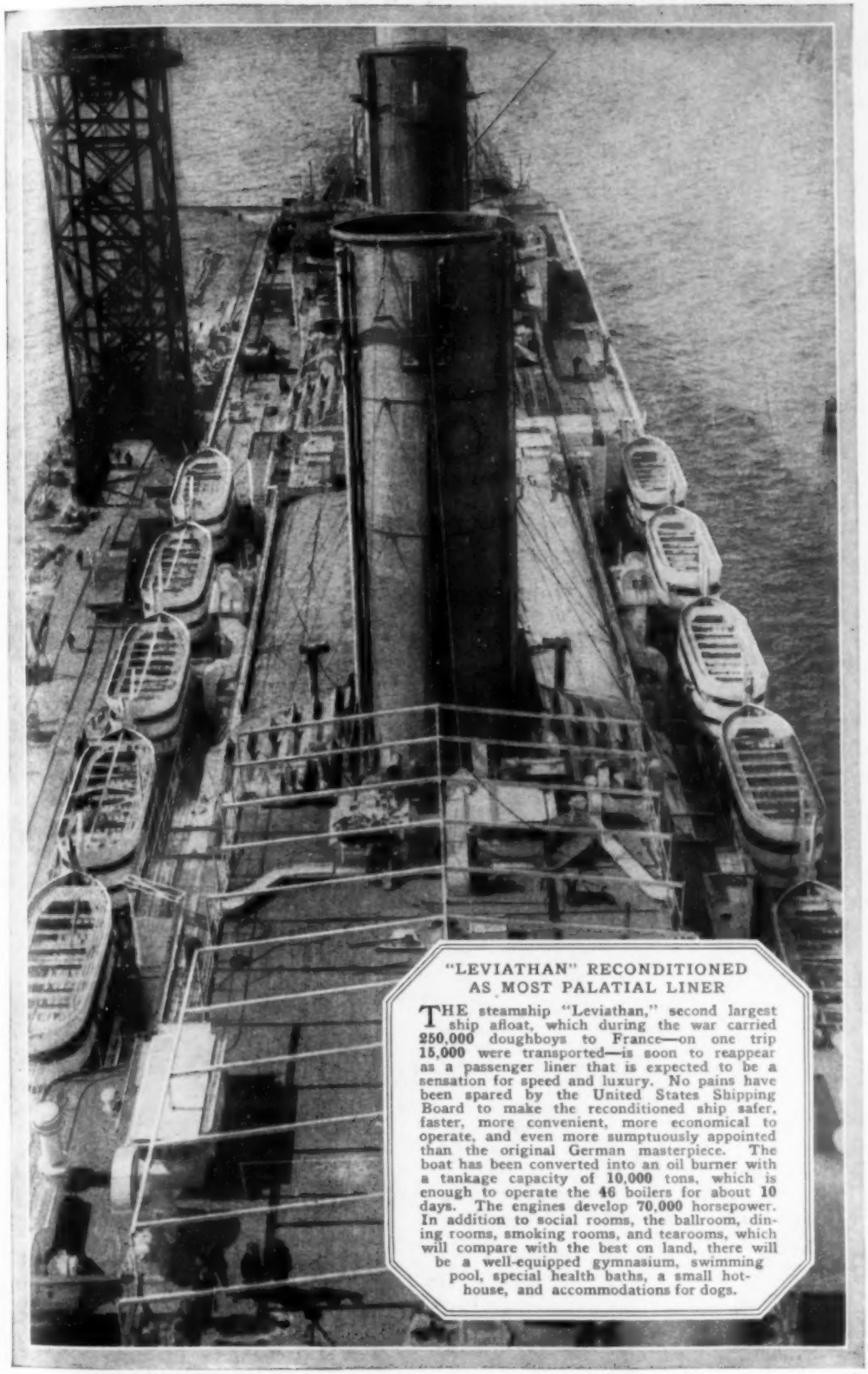
THE long-sought art of preserving the human form after death in nearly lifelike aspect, has apparently been achieved in a scientific method developed by an expert embalmer who, as a pioneer in this field, has devoted years of thought and patient investigation to the work. The method not only promises to afford a means of perpetuating the illustrious dead more successfully than the Egyptian mummies, but offers possibilities for the disposition of the dead in sanitary ways that introduce none of the objections of ordinary burial methods nor of cremation. As in many other modern inventions, electricity plays the leading part in the apparatus wherein the body is sterilized and dehydrated beyond the point where the organisms that cause decomposition can exist. The method also offers an opportunity to test for suspended animation by the application of electricity under proper control and of reviving apparently dead persons under the stimulating action of the electric current.

The apparatus which has been assembled at small cost by the inventor himself, has the outward appearance of a sarcophagus and consists of a chamber which receives a rolling copper table upon which the body is placed. This table forms one terminal for the contact with the body and the other terminal consists of a number of contacts made on the upper surface of the body. When the circuit is closed an electric current passes through the body at many different points, setting up sterilizing action due to the heat produced by the resistance offered by the body, and an electrolytic action that reduces the moisture. It is possible that the sterilization is assisted by the breaking up of saline solutions into chlorine and caustic soda, both active sterilization agents. Electric-resistance units placed below the table in the chamber supply additional heat, and an exhaust fan changes the atmosphere in the chamber at regular intervals. The electrical-control devices provide for regulation of the temperature and current by means of red signal lights and an alarm bell as well as recording instruments. The success of the method is attested by experiments performed upon dogs and cats, and by a test upon the body of a man who was the victim of a bullet. The test upon the man's body was witnessed by persons of authority, and they were surprised to note the absence of any discoloration due to the method, and that the form showed so little apparent shrinkage, although there was a loss in weight of about one-fifth.



This View Shows the Steamship "Leviathan" at the Dock at Newport News, Where It has been Undergoing a Reconditioning That will Cost $10,000,000. It was Predicted by Foreign Experts That the Big Ship, Which Had Innumerable Patterns and Materials Peculiar to German Industry and Workmanship, could Not be Reconditioned in the United States. It is Now Pointed Out That This Work is Not Only Nearly Completed, but That the United States Shipping Board will Deliver a Far Better Product than First Slipped from the German Ways. To Reproduce the Ship Today would Cost About $30,000,000

PHOTOS COPYRIGHT, UNDERWOOD & UNDERWOOD



"LEVIATHAN" RECONDITIONED AS MOST PALATIAL LINER

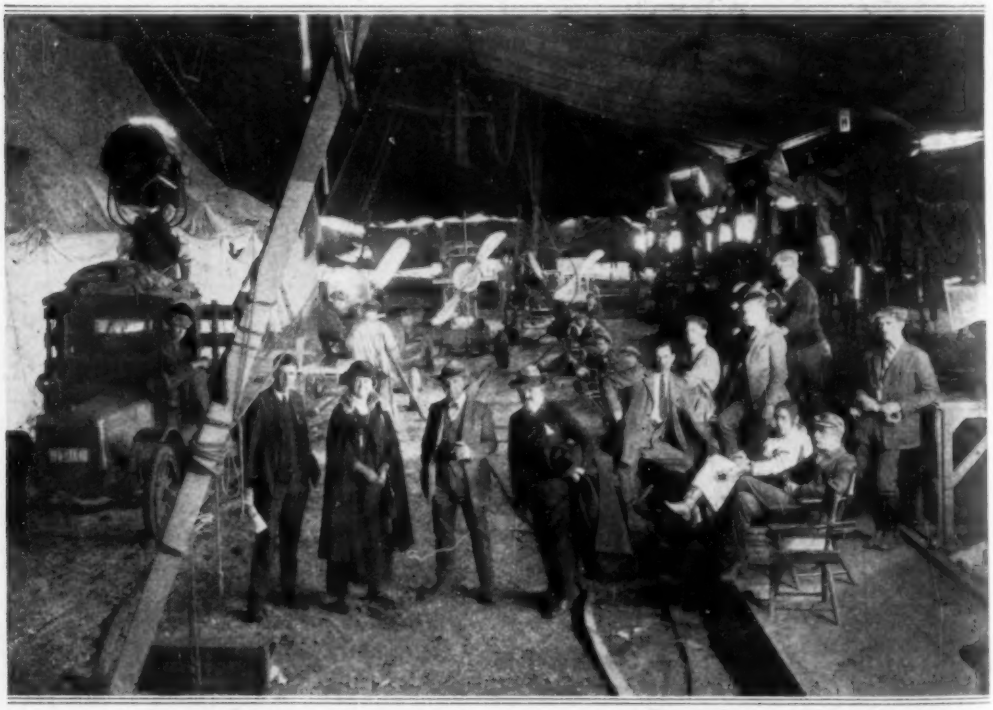
THE steamship "Leviathan," second largest ship afloat, which during the war carried 250,000 doughboys to France—on one trip 15,000 were transported—is soon to reappear as a passenger liner that is expected to be a sensation for speed and luxury. No pains have been spared by the United States Shipping Board to make the reconditioned ship safer, faster, more convenient, more economical to operate, and even more sumptuously appointed than the original German masterpiece. The boat has been converted into an oil burner with a tankage capacity of 10,000 tons, which is enough to operate the 46 boilers for about 10 days. The engines develop 70,000 horsepower. In addition to social rooms, the ballroom, dining rooms, smoking rooms, and tearooms, which will compare with the best on land, there will be a well-equipped gymnasium, swimming pool, special health baths, a small hothouse, and accommodations for dogs.

PHOTOS COPYRIGHT, UNDERWOOD & UNDERWOOD

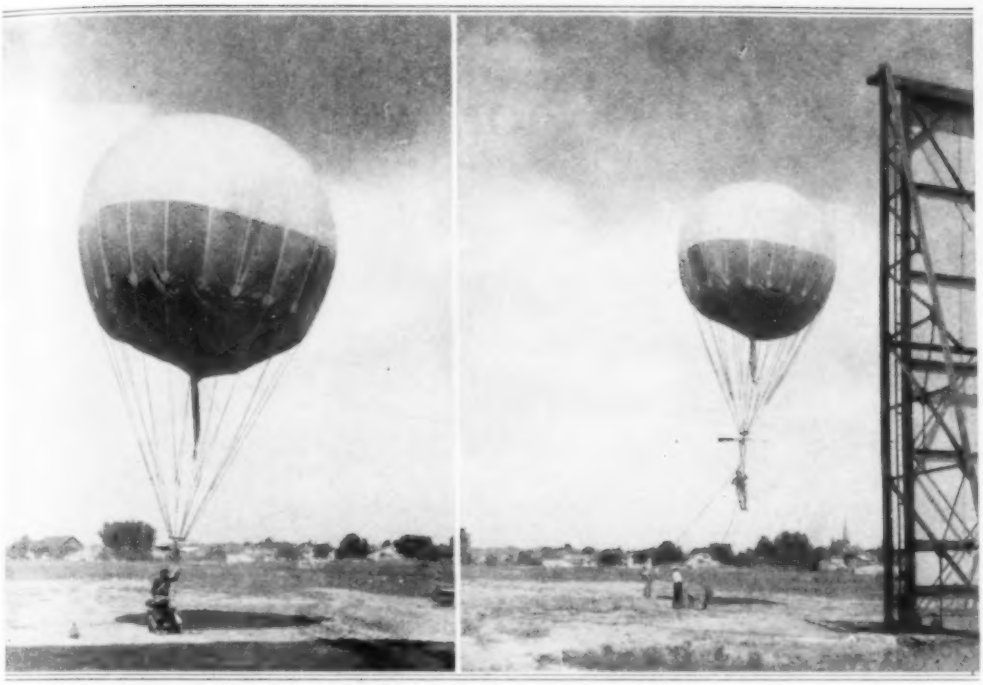
The Radiophone as Used in Teaching the Deaf to Hear: The Teacher Speaks Plainly and Slowly into the Transmitter, and the Pupil Listens through the Usual Head Receiver. The Method has Been Fairly Successful

TEACHING THE DEAF WITH RADIOPHONES

Radiophones have been used during the last year as an aid in teaching deaf children in the Cincinnati public schools, by Miss Clara B. Cooper, formerly of the Deaf, Dumb, and Blind School at Berkeley, Calif. The radio experiments conducted at this school were fully discussed in our January issue. In several other places somewhat similar work has been done, and it is the consensus of the teachers that radio will prove of increasing value in making the deaf hear, although this point cannot as yet be definitely settled.



SPECIAL tent and mechanical devices erected for filming part of the forthcoming motion picture "Souls for Sale"—a story of how motion pictures are made. On the occasion of the recent visit there of a member of our staff, Maj. Rupert Hughes, the author who is directing the production of his own story, stopped work while the above picture was taken. Major Hughes stands in the center of the group holding a cigar; at his right, Mr. Roys, of this magazine, and his wife, at left.



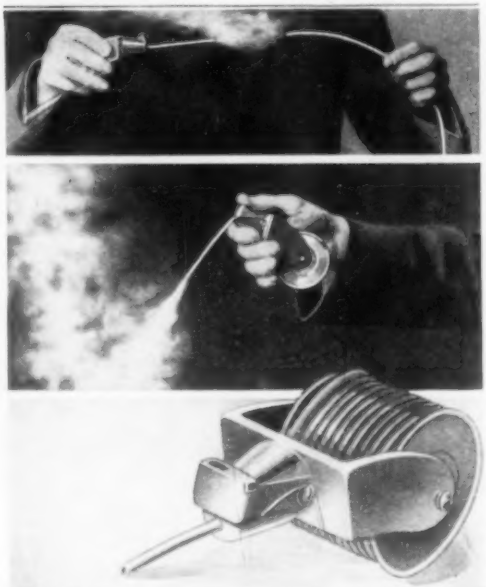
Left: New "Jumping Balloon" Developed by Employes of the Engineering Division at McCook Field, Dayton, Ohio, Ready to Begin an Ascent. Right: Balloon About to be Cut Loose for an Ascent. The Feature of This Balloon Is a Small Control Propeller

NEW-TYPE SPHERICAL BALLOON HAS PROPELLER CONTROL

The novel feature of a new balloon, recently tried out, lies in a third means of control, which consists of a propeller that can be revolved by a rope belt within reach of the pilot. A pull on the right-hand side causes the balloon to ascend, while a left-hand pull causes descent. The weight of the entire equipment, including bag, rigging, basket, and propeller mechanism, all of which can be folded into a small enough bundle to be carried in a small car, is only 125 pounds. A three-hour flight has been made by a 186-pound man, without using the gas valve and at the expense of only one bag of ballast. Among the advantages are quick get-away without dropping too much ballast, and ascensions from grounds surrounded by buildings and other obstructions.

NEW DEVICE FOR LIGHTING BLASTING FUSE

A convenience for blasting work is seen in a new device for lighting the ends of the fuse preparatory to firing a round of holes. The device consists of a spool holding about 25 feet of lead tube filled with black powder, and the spool holder, which also carries a knife for cutting off the burning end of the tube.



Top: Applying New Lighting Device to the End of Blasting Fuse. Center: Cutting Off Burning End of Tube. Bottom: Close-Up of Device

FLOATING LAND FOR HOME SITES IN HOLLAND

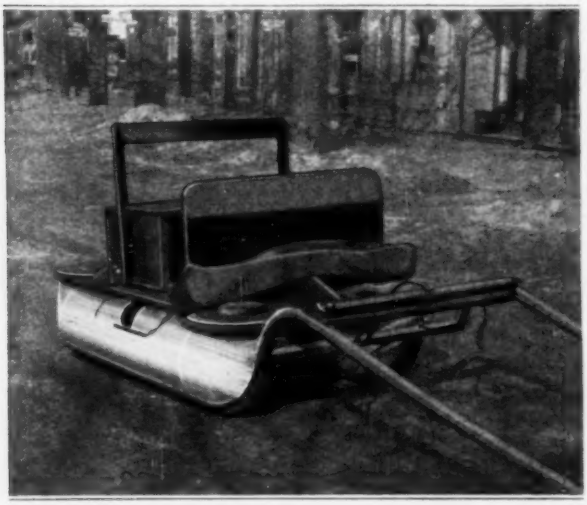
A View Just beyond the Limits of the Village of Giethoorn, in Holland, Where Sections of Water-Logged Land are Cut Away and Floated to Town: A Long Narrow Piece is being Guided along the Canal, and is Seen Just Arriving at the Village. Great Maneuvering Skill Is Necessary for This Work

OF all the countries of Europe, Holland affords, perhaps, the best example of how the topography of a country affects the habits of its people, and influences their lives. A considerable portion of the Low Country lies below the level of the sea, and it was to resist its cruel invasions that the gigantic levees, or dikes, were built. Nevertheless, some of the flooded regions, perodically inundated by the sea, have been waterlogged for centuries, and one of these is the province of Overyssel. Way up in northern Holland it lies, skirted by the

Four of the Professional Land Cutters Slicing Off a Section of Ground Preparatory to Floating It to Town: It is Then Carefully Guided through the Canals and Brought to Rest Wherever the Prospective Home Builder Desires to Build His House

A View of "Main Street" in the Floating Village of Giethoorn, in the Province of Overyssel, Holland: The Skillful Dutchmen have Towed and Pushed Their Floating Strip of Land Right into Town, and Are About to Guide It under the Bridge. One of Them is Giving It a Shove to Clear It from the Bank and Start It under the Bridge

mighty Zuider Zee, and perhaps its quaintest spot is the floating village of Giethoorn. Taking advantage of the condition of the soil, these hardy Dutchmen have learned how to cut away sections of turf, and then float them to the spot where they are wanted. Considerable skill, of course, is necessary to escape a ducking, because the footing is uncertain and slippery, and the marshland deceptive and treacherous. Poles, about 12 feet in length, are employed to shove off the floating home sites, which are cut away beyond the village limits and then guided to town. Some 8 or 10 men follow this work exclusively, and, naturally, are very adept in the handling of their poles and the "islands" in their charge. All of Giethoorn has been built up in this manner, until now it boasts a population upward of 2,000, living on the fertile strips which bank its canals.



This Sled, Built with Cylindrical Runners, That will Hold Luggage, Glides over Ice, Snow, or Water

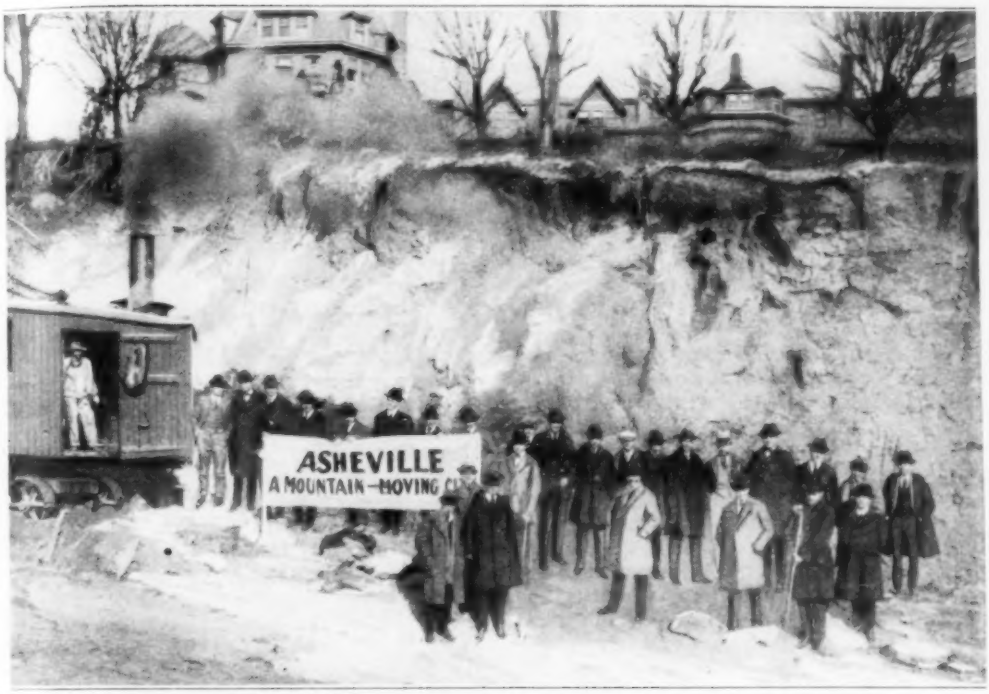
SLED CAN BE RUN OVER ICE, SNOW, OR WATER

A horse-drawn sled which glides equally well over ice or loose snow, and which, because of its pontoonlike runners, can also cross shallow streams or other bodies of water, has been made by a Canadian. The runners, the only unusual feature of the sled, are air-tight metal cylinders, having along their underside a converging projection which enables the sled to glide over ice. The peculiar build of the cylinders makes it also possible for them to be effective in soft snow or water. There are doors in the cylinders, so that the interior can be used for carrying luggage if so desired.

PORTABLE SAND HEATER FOR PAVEMENT REPAIRS

The difficulty of making a suitable sand and asphalt mix under heavy-traffic conditions has prompted a southern street-car company to devise a portable sand-heating unit, along the same lines as the asphalt units which have long proved effective. A motor-driven drum, taking power from the overhead trolley wire, is charged with sand, then revolved slowly over a furnace contained in the unit. A temperature of 400° F. is attained, which has the effect of driving off the moisture and thereby facilitating a mix with the previously heated asphalt. The materials are used in equal parts, and the mix is poured between the granite blocks alongside the street-car tracks. When carefully prepared, as in this case, the mixture forms an excellent filler and binder for this purpose.

A Portable Repair Outfit for Pavement between, and Abutting, the Street-Car Tracks: The Sand and Asphalt are Heated to 400 and 370° Respectively before Mixing, the Higher Temperature of the Sand Keeping the Mix Sufficiently Hot to Flow Readily



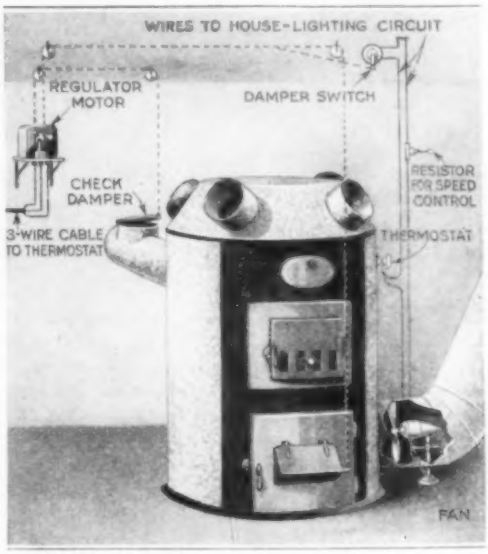
This Picture Shows the Old Height of Battery Park Hill, and the Progress Which has Already been Made by the Company Employed to Remove It. In the Background may be Noted the Upper Part of the Old Hotel, Which has Helped Make the City a Popular Winter Resort

HISTORIC BATTERY PARK HILL AT ASHEVILLE REMOVED

Bodily removal of Battery Park hill, Asheville, N. C., which is well known to thousands who have visited there, is now under way. During its reign, the hotel on the hill entertained numerous celebrities who, attracted by the magnificent views, the climate, and old-fashioned hospitality, made Asheville one of the most famous winter resorts of the South. With the growth of the city, however, it has finally become necessary to demolish the old hotel, and to use the land surrounding for business purposes. In its stead will be erected a new ten-story structure, the roof garden of which will be just above the present summit of the hill.

REGULATOR AND FAN EFFECT FURNACE ECONOMIES

An economy of 20 per cent is claimed for a combination of two devices to be applied to warm-air furnaces to increase the circulation of air. One of these is a fan installed in the base of the furnace to accelerate the draft; the other a regulating device placed at the top of the furnace shell. It is operated by electricity to start or stop the fan and open or close dampers as required. Economy of fuel is effected, the manufacturers claim, by removing the necessity of using fuel to create draft.



Furnace, Showing Installation of Devices to Promote Air Circulation and Fuel Economy: Upper Left, Motor Regulator and Check-Damper Control; Right, Fan in Air Inlet, and Thermostat

THE AMERICAN DOG DERBY

BY O. J. GRIMES

SO long have we associated dog teams and sledges with Alaska and the Hudson's Bay country that we have come to believe that this mode of travel is peculiar to the regions of the Far North. But it isn't. In that section, west of Yellowstone Park and between the Union Pacific winter railhead at Ashton, Ida., and the Great Northern, trappers, woodsmen, and ranchmen travel by dog sledge through the long winter and frequently haul burdens of a thousand pounds or more.

In celebration of the snowfall, so necessary to crops of farm and range in the region, and to afford winter recreation, the community of Ashton decided to make use of the unusual feature of the dog sledge. It organized the American Dog Derby Association, and at mid-winter of each year invites anyone with a dog team to participate in the American dog derby, a test of speed, gameness, and clever driving, rather than of endurance. It is a 25-mile course, which is sufficiently grueling when covered in less than 2 hours 10 minutes, as it was this year.

The huskies of the North are not looked upon with favor in this country because the distances are not so great as in Alaska and greater speed is desired. Bird dogs, crossbred with German and Belgian police and even Russian wolf and staghounds, are most favored, although this year some shepherds also were given a trial. But the bird dogs were the winners. Of ten teams starting, five made the 25-mile journey almost in a bunch, less than 18 minutes separating the first and the fifth, and the two lead teams crossed the tape just 14 seconds apart.

Aside from forming the feature of a winter carnival that is attracting international interest, the dog derby is stimulating an unparalleled interest in dog breeding. The intelligence of the bird dog, as well as its gameness, is being crossed with the strength of the police dog, and the results being obtained are something watched closely by dog fanciers throughout the country.

Drivers of this country admit that huskies are better for the distances of the Far North, but insist the dogs they are breeding can run rings around huskies on a 25-mile course and are issuing challenges to their brethren of the North to come down next winter for a test.

PHOTOGRAPHS WIRELESSED BY RADIO

The Photograph of President Harding Wirelessed from Washington to Philadelphia

Another Good Example of Wireless Photography in Profile

A Picture Sent Full Face: The Blemishes are Attributed to Static Interference

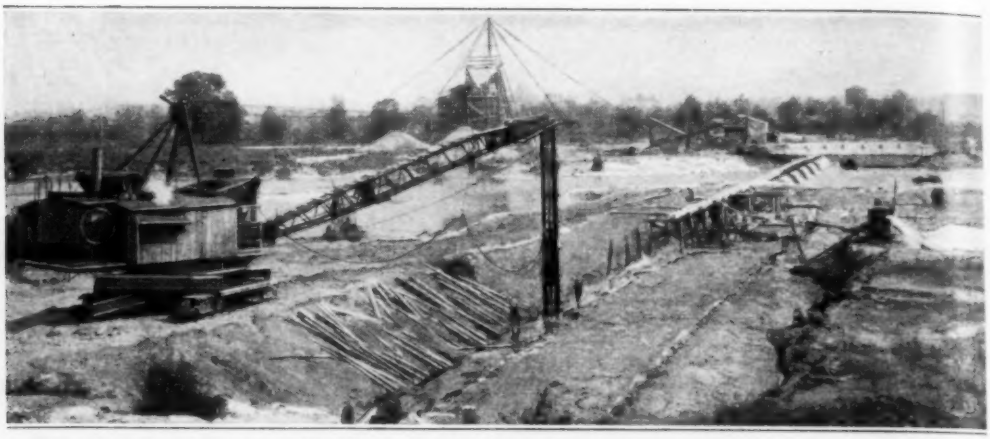
The first photographs ever transmitted by radio in the United States were made recently by the United States Naval Radio Station at Washington, and wirelessed to Philadelphia. The apparatus by which these pictures were sent is the invention of C. Francis Jenkins, who is also the inventor of the first motion-picture machine, and a description of it appeared in the December, 1922, issue of Popular Mechanics. Its salient feature is a prismatic annular rim which is rotated at high speed, transferring light impulses into electrical impulses and then into radio impulses. An 1,150-meter wave length was used in the sending of these photographs. Although the transmitted pictures are not perfect, they are easily recognizable, and experts state that the faults are remediable and will be eliminated with improvements in radio reception. The sending was done from ordinary photos.

Olcott Zarn, 15-Year-Old Schoolboy, Driving His Single-Harness Team to Third Place

Above: **Miss Lydia Hutchinson, Known as One of the Best Woman Drivers, "Harnessing Up"**

Right: **One of the Contestants Leading the Procession in the Girls' Junior Derby**

"Smoky" Gaston, Trapper, Mail Carrier, and Three Times Champion, Again Winning the American 25-Mile Dog Derby



Dragline Excavator Operating a Pile Driver during Construction of a Dam across the Miami River at Hamilton, Ohio: In the Background Appears the Gravel Plant That was Built to Handle Gravel Accumulating in the Artificial Settling Basin Created by the Dam

COÖPERATION WITH RIVER AVERTS FLOODS

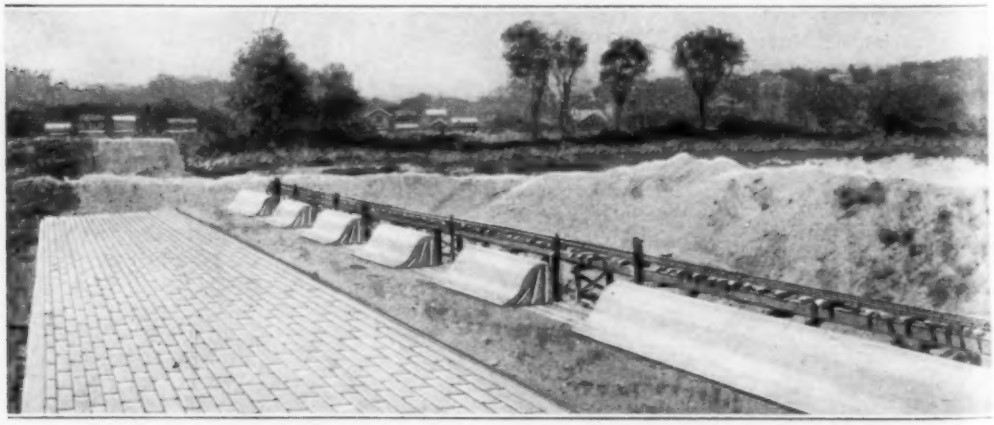
BY IVAN E. HOUK

EVERYONE who has walked along our river channels knows that during flood periods the water moves the gravel along the bottom, depositing it in some places and scouring it out in others, often filling in sewer outlets, choking navigable waterways, and interfering with various commercial activities.

Inasmuch as this habit seems uncontrollable, except by the construction of large and expensive works, the Miami Valley flood-control authorities decided to keep the improved channel at Hamilton, Ohio, clean by coöperating with the river rather than by attempting to curb its natural tendencies. Consequently they built a concrete dam across the channel at the upper edge of the city, just high enough to form a pool and cause the gravel to settle; and then arranged with a local gravel company to build a plant at this location and to take its supply from this artificial settling basin.

Both dam and gravel plant are now completed and operating as planned. If at some time in the future the floods should deposit gravel faster than the market demands, the excess can be excavated and stored along the bank. If, on the other hand, the floods do not bring the gravel fast enough, the bed of the river can be excavated below its natural level.

In constructing the dam, a dragline machine was used in excavating for the foundations, in driving piles, and in building cofferdams around the different sections of the dam. Five gaps, 24 feet long, were left in the first section, to

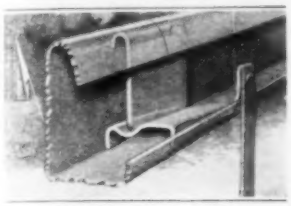


First Section of the Hamilton, Ohio, Dam during Construction: Note the Gaps Left in This Section to Carry the Flow of the River While the Remaining Portion was being Built; Also the Flexible Concrete Apron along the Downstream Apron

carry the river flow while the remaining portion was being built. These were filled in one by one. The dam is protected from undermining by steel sheet piling along the upstream apron, and by timber piling and a flexible concrete-block mattress along the downstream apron, the flexible mat being 40 feet wide.

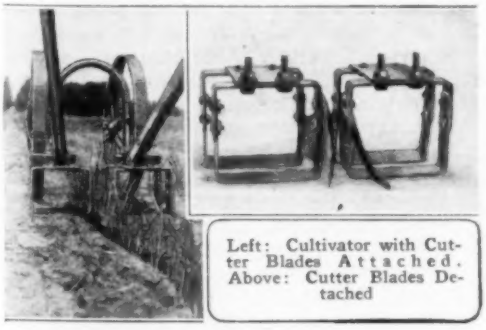
CONCRETE ROAD FORM HAS NEW FEATURES

Several interesting changes are apparent in a new type of concrete road form which has recently appeared on the market. The new form is of steel, 3/16 inch thick, and comes in 12-foot sections instead of the usual 10-foot lengths, thereby reducing the number of joints necessary to be installed. The top edge of the form has been made rounded, making it impossible for small stones or concrete to lodge there and cause the finishing machine to ride high. Flat steel stakes, of 18-inch penetration, pin the form to the subgrade.



BLADES ON CULTIVATOR SAVE HAND WEEDING

A new form of a cutter blade for attachment to a hand cultivator is a new device for the home gardener. It consists of two pairs of sharp steel blades which go through the soil like a hoe, cutting weeds below the surface. They are provided with sets of shields or leaf lifters which permit cultivating close to the plants and do away with much hand weeding.



Left: Cultivator with Cutter Blades Attached. Above: Cutter Blades Detached

PORTABLE FARM ELEVATOR FOR HAY OR FEED

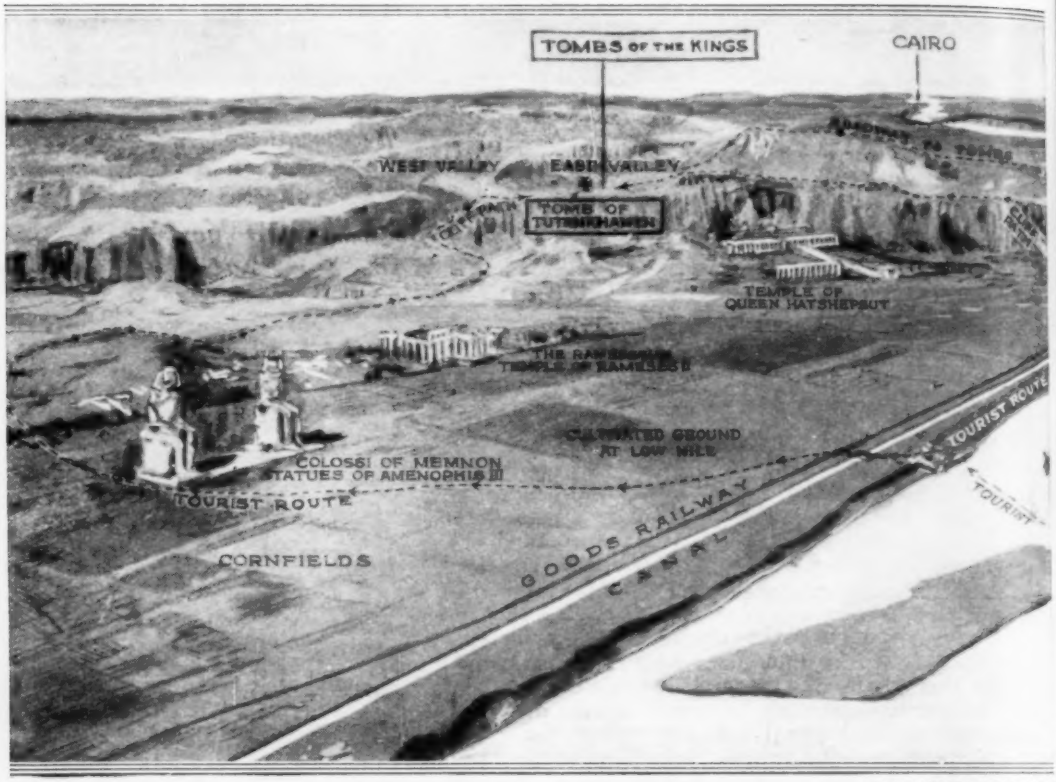
A portable elevator has been found of great use at the Missouri Experimental Farm in raising bales of hay and

Portable Elevator for Raising Baled Hay and Mill Feed into Barn Loft

sacks of mill feed into the loft of the dairy barn. The incline has a steel base on which the load rests as it is raised by slats attached to a chain. The ends of the slats are carried on small wheels running in grooves. The elevator is adjustable for height and will lower loads by reversing. It is operated by electric or gasoline power.

CHICAGO "L" CARS TO HAVE PLUSH CROSS SEATS

Plush cross seats similar to those designed for railroad coaches, a mahogany interior finish, an arrangement of shaded side lights, and an automatically controlled electric-heating system are to be some of the unusual features of a new type of car ordered for Chicago's elevated lines. More than 100 of the cars have been bought, and it is expected they will be in the regular service in May. They cost $22,000 each.



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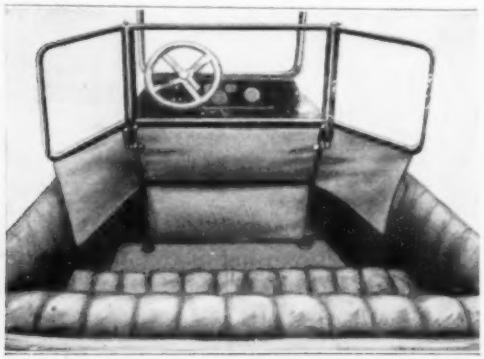
The Above Picture Shows the Lay of the Country around the Famous Valley of the Tombs of Kings into Which Tour to Accommodate the Visitors Who Come There Every Winter to Visit the Historic Tombs at Karnak and Across the Nile and on One of the Principal Roads to the Tombs of Kings, Are the Colossi of Mem

WINDSHIELD FOR REAR SEATS EASILY ATTACHED

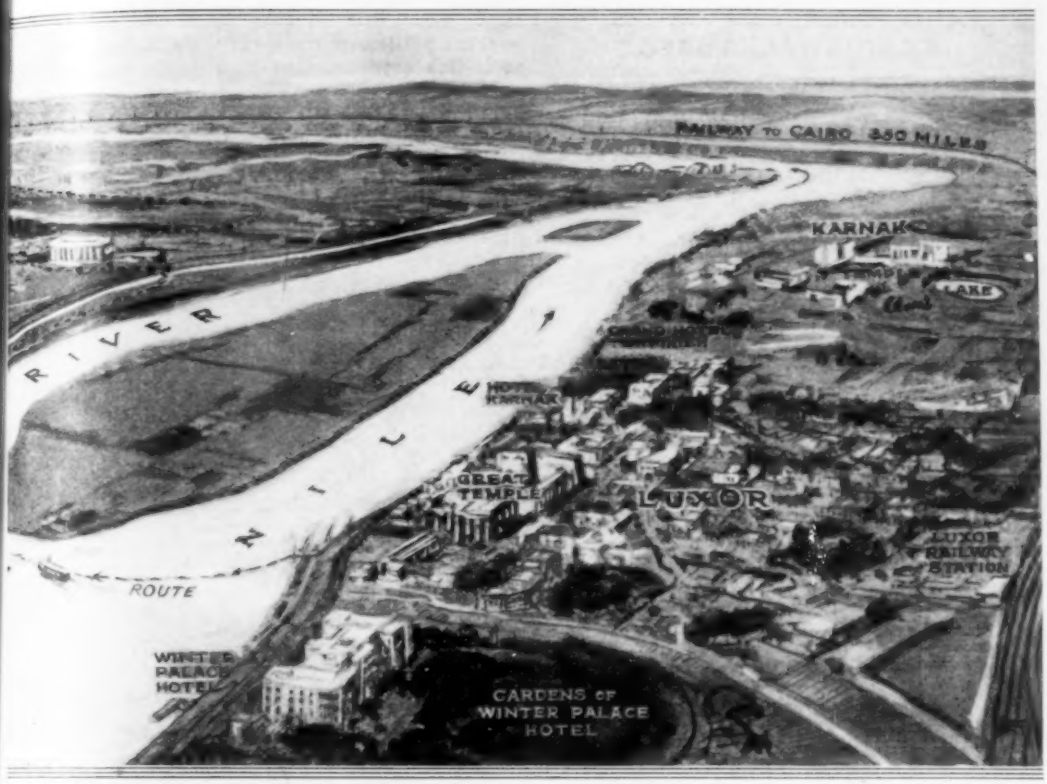
A windshield which can be easily attached to the back of the front seat has been devised for increasing the comfort of automobile passengers occupying the rear seats. The new attachment has glass panes which are mounted in a black-enameled steel frame, the center pane being stationary and secured with rigid attaching brackets. Two side panes, or wings, are mounted on vertical pins located on each end of the center pane, and these can be adjusted to any angle and locked in position. Curtains are also furnished for attachment to the lower edges of the frames.



A Tonneau Shield with Adjustable Wings: The Attachment is Said to Be Rattle-Proof, and Easily Secured to the Back of the Front Seat

NEW TREATMENT IMPROVES QUALITIES OF SILK

Stronger and more elastic silk is obtained by a special treatment recently developed in France. After weighting, the silk is treated with tin phospho-silicates and organic compounds in a suitable solvent at temperatures up to the boiling point. Preference is given to compounds that are soluble in water, or evaporate at ordinary temperature, or do not give colored reactions, which include compounds containing nitrogen and sulphur. Useful organic compounds mentioned are chlorine, betaine, alkaloids, and others more easily reduced than fibroin.



BY THE SPHERE, LONDON

ists are Streaming to View the Tomb of King Tutankhamen. At the Right Is Luxor, Which Possesses Many Hotels Thebes. Just to the North of Luxor Lies Karnak, Famed for the Wonderful Ruins of the Temple of Ammon. non, Two Gigantic Statues That Once Marked the Entrance to a Temple Erected to Amenophis III

HOW TOURISTS REACH TOMB OF TUTANKHAMEN

The tourist desirous of visiting the new-found tomb of Tutankhamen travels from Cairo by boat or rail 350 miles up the Nile to Luxor, which lies at the river's edge on the east bank. To reach the spot, it is necessary to "go west," as described in the ancient "Book of the Dead," and a short trip across the Nile lands the tourist at a point where two routes lie open to him—one westward across the fertile flat, past the Colossi of Memnon, and up the cliffs to the south of the Valley of the Tombs of Kings; the other along the river to the outlying spur of the range of hills, where the tourist may choose between a path along the cliff or a longer roadway around the hills.

¶ Word comes from England that an important weekly has begun the use of the new rubber-latex paper, in which up to five per cent of raw rubber is incorporated with the pulp.

TRACTOR PROVES EFFICIENT FIRE FIGHTER

Considerable ingenuity is evident in the novel adaptation of a track-laying tractor for fire-fighting purposes, at the Naval Proving Grounds at Aberdeen, Md. Frequent target practice increased the fire hazard, but a large area of soft ground prevented access of the heavy fire engines. A tank mounted atop of the tractor transformed it into a miniature fire-fighting unit, which could go anywhere and fight the small blazes.

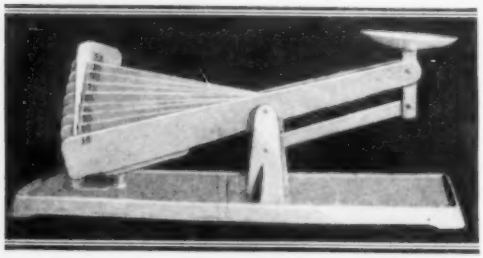
SAND SPRINKLER MAKES ICY SIDEWALKS SAFE

When the sidewalks in Milwaukee are slippery with ice, a sand-sprinkling machine is used to make them safe for pedestrians. Mounted on two wheels is a triangular box filled with sand and with an opening at the apex of the triangle. A chain runs around a sprocket on the inside of one wheel and around a smaller sprocket just below the outlet. As the chain moves it engages a third sprocket which operates an agitator in the outlet and sprinkles the sand upon the ground.

Machine Used to Sprinkle Sand on Icy Streets: A Chain Running on Sprocket Wheels Works an Agitator That Scatters the Sand from the Box

EGG-GRADING SCALE TELLS WEIGHT PER DOZEN

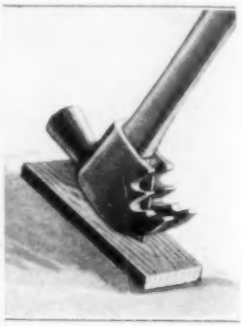
To make the grading of eggs by weight more convenient, there has been invented an improved egg-grading scale, which gives the weight per dozen of any-size egg. One side of the beam consists of several blades of uniform weight, marked to indicate the weight of a dozen eggs of the size of an egg placed in the pan at the opposite end of the beam. When there is no egg in the pan, the scale is in balance, but when an egg is placed in it, that side of the beam goes down, and the opposite side rises. As it does so, it picks up one blade after another until balance is again restored. The lowest visible number then indicates the weight of a dozen eggs of the size in the pan.



With This Grading Scale, the Lowest Number Visible on the Blades to the Left Indicates the Weight per Dozen of Any Egg Which is Placed in the Cup

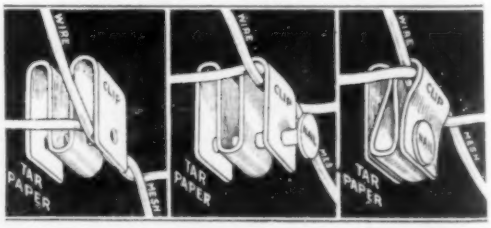
STEPPED CLAW HAMMER MAKES NAIL PULLING EASY

An ordinary carpenter's hammer has been modified in such a way as to dispose of the usual difficulty of having a nail stick when it is partially pulled out. This hammer has a series of three sets of claws, instead of the single set usually found. The claws are staggered in steps, thus making it possible to use whichever set of claws will give the best leverage on a particular nail.



FURRING CLIP FOR WIRE MESH HELPS PLASTERING

A new type of furring clip, made of galvanized plate, has been placed on the market, which is intended to be looped over the mesh with which it is used, and then be secured to the sheathing of the building. The clip has four leaves, each being so punched that the nail passes through all the four holes.



The New Furring Clip Showing, from Left to Right, How It is Applied to the Wire Mesh and Nailed to the Wall

COPYRIGHT, KADEL & HERBERT

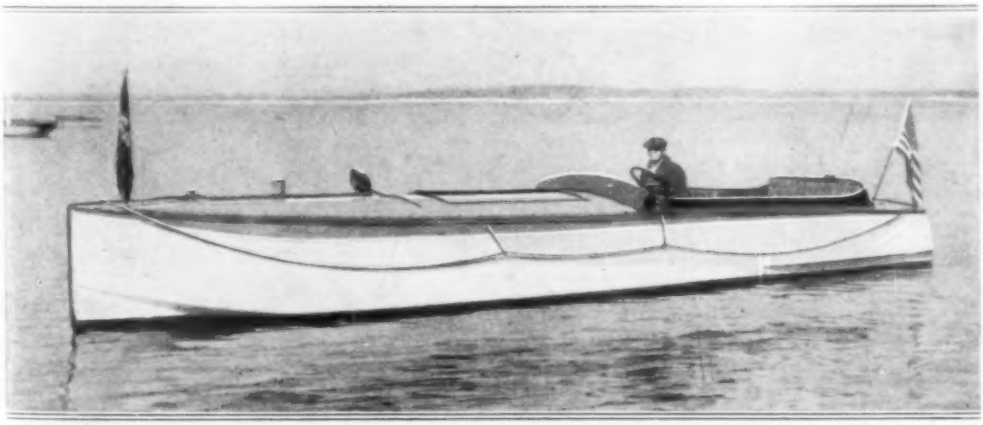
Spanish Helicopter Which is Reported to have Recently Ascended to a Height of 81 Feet and to have Successfully Carried Out Several Horizontal Flights: The Machine is Supported by a Four-Bladed Propeller and is Motored by an 80-Horsepower Engine

UNIVERSITY OF WISCONSIN BUYS SPEEDY LIFEBOAT

The "Isabell," the new lifeboat recently purchased by the University of Wisconsin for over $4,000, is said to be one of the fastest and finest boats used for this kind of work. In its trial run on Lake Mendota, it attained a speed of 28 miles an hour, and it is claimed that it is capable of doing even better. The craft is 30 feet long, with a 6.6-foot beam, and replaces launches which have hitherto served the double purpose of life-saving boats and coaching launches. Sixty-eight persons were rescued during the past year with one of the boats which the "Isabell" is replacing.

SPANISH HELICOPTER RISES 81 FEET

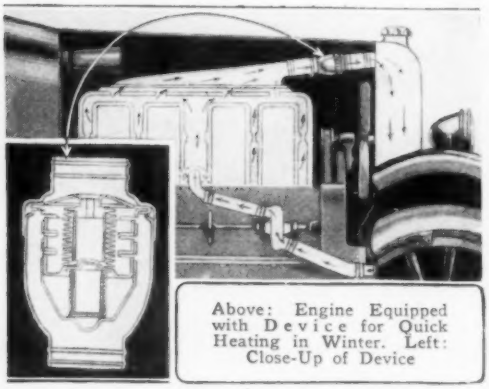
A helicopter built by a Spanish engineer successfully rose to a height of 81 feet and maneuvered in the vicinity of the aerodrome, according to recent reports from Madrid. The machine, which is powered with an 80-horsepower engine, is designed very much along the lines of the ordinary airplane except for the smaller wings which are replaced by a large four-bladed propeller mounted on a vertical shaft. In addition to this performance, the present unofficial world's records for free helicopters stand as follows: duration of 2 minutes 37 seconds, and distance of 250 feet, both made in France.



The "Isabell," Purchased by the University of Wisconsin, to be Used as a Lifeboat on Lake Mendota: The Craft Is 30 Feet Long, Has a Beam of 6.6 Feet, and Is Capable of Doing 28 Miles an Hour or More. Its Steering Wheel and Other Controls Resemble Those of an Automobile

AUTO ENGINE HEATS QUICKLY WITH NEW DEVICE

The problem of heating an automobile engine to the proper operating temperature in cold weather has been greatly simplified by a device that is inserted in the water-circulation system, between the cylinder head and the radiator. It consists of a valve that automatically prevents water from going to the radiator, until it has reached a predetermined temperature. A seepage of one-tenth prevents the radiator from freezing.



Above: Engine Equipped with Device for Quick Heating in Winter. Left: Close-Up of Device

REMODEL RAILWAY STATION AT OSAKA, JAPAN

Remodeling of the Osaka railway station, which is to be begun in the latter part of 1923 and completed in 1931, embraces plans for large passenger stations separate from each other. In order to provide space for the new terminals, some additional land, including the present sites of several schools, has been acquired. The freight yards and station will be the largest and most up-to-date in Japan. A canal leading to the freight yard will be constructed for the purpose of transferring cargoes quickly to boats. The cost is estimated at $15,000,000.

SKATING ON LINCOLN MEMORIAL REFLECTING POOL

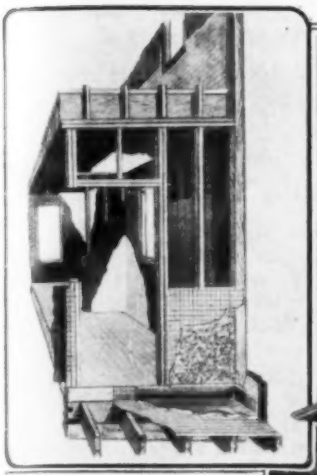
Washington ice skaters enjoyed a treat in February when the water in the new reflecting pool in front of the Lincoln Memorial froze to a sufficient thickness to permit skating. Opportunities to skate in Washington are quite rare, and when they do occur all classes take to the ice.

In May the memorial, built of Colorado marble at a cost of $2,939,729, was dedicated with elaborate ceremonies. In December, with less elaborate ceremonies, the water was turned into the reflecting pool. These ceremonies had kept up the interest in the memorial and the pool. From the day it was announced that a pool would be constructed, however, the lovers of skating had been anxious to learn whether they would be allowed to use it for this sport.

Finally it was announced that skating there would be permitted.

An interesting detail in connection with the construction of the pool, is the fact that it was found necessary to waterproof the bottom thoroughly. This was done by digging the basin, which is 2,000 feet long and 160 feet wide, sloping to a depth of 3½ feet in the center. The bottom was then covered with cinders, followed by alternate layers of asphalt and tar paper. Upon this substantial base was laid the final layer of slate.

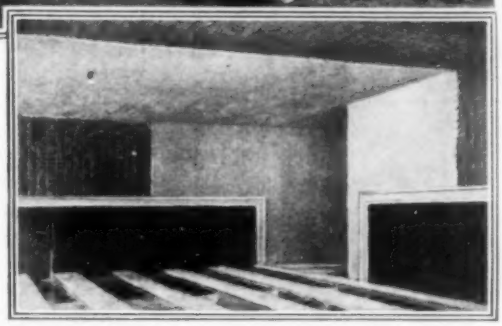
Outdoor Enthusiasts of Washington, District of Columbia, Enjoying the Privilege of Skating on the Reflecting Pool of the Lincoln Memorial: After Waiting Most of the Winter, They were Rewarded When a Cold Snap in February Froze the Surface of the Pool to a Safe Thickness



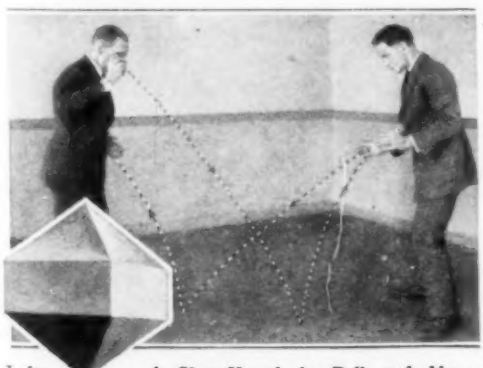
An Exterior View, Showing the Application of the Steel Fabric to Both Exterior and Interior Walls, as Well as to Porch Floors

NEW STEEL FABRIC SIMPLIFIES STUCCO WORK

Of interest to architects and home builders is the recent development of a galvanized-steel mesh fabric which serves as a base for stucco or plaster work. The fabric is backed with a saturated rope-fiber waterproofing material, which, being porous, exerts a capillary attraction on the plastic material and thereby tends to hold it in place. The fabric itself functions primarily as a reinforcement to the applied stucco or plaster, and by eliminating keys, has an equal reinforcing value in all directions. Another advantage is that no furring strips are required, the fabric being crimped at uniform intervals and in reality "self-furring." These features insure an exceedingly workmanlike job, without seams or lines of weakness in any direction.



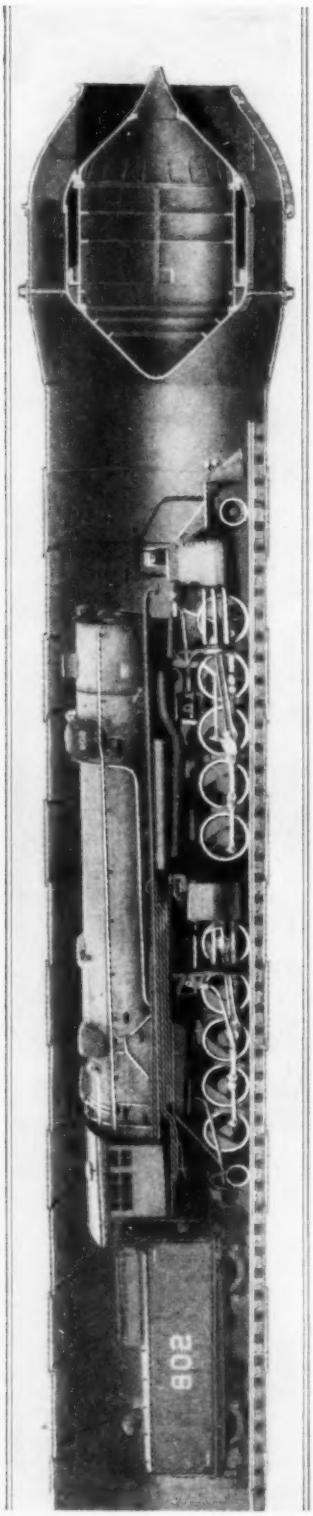
Above: Applied as Stucco Reinforcing on a Frame House. Below: Showing How the Steel Fabric is Used on Walls and Ceilings of a New House



Left: A Close-Up of the Ball, and Above, One of the Simple, Though at Times Strenuous, Games Which may be Played with It

MANY-CORNERED RUBBER BALL GIVES GREATER EXERCISE

A solid rubber ball with 10 corners and 12 faces has been made to furnish additional excitement to games usually played with a round ball. Under the same conditions, an ordinary ball will always act in one certain way. The new ball is anything but dependable; no matter how carefully the players may endeavor to duplicate a special rebound, the likelihood is that every time it hits the floor, it bounces off in a slightly different direction. This, of course, makes the playing more interesting—and more exciting.



MAMMOTH PENSTOCK EASILY ACCOMMODATES WORLD'S LARGEST LOCOMOTIVE

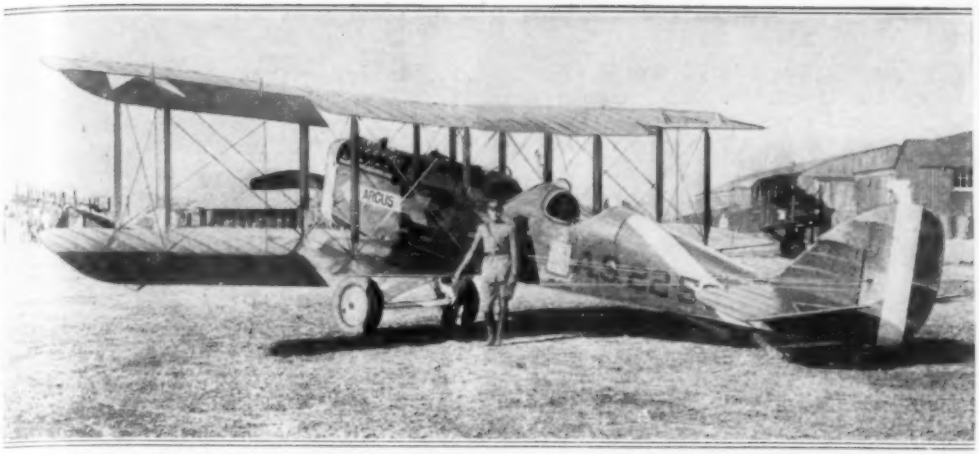
THIS giant penstock, or tube, 21 feet in diameter and 600 feet long, is one of a series of three constructed for the Niagara Falls 200,000-horsepower hydroelectric development. They will be drilled through solid rock, and are designed to pass a flow of 2,800 cubic feet of water per second to three turbines, each rated at 70,000 horsepower, located in the power house below them. Some conception of their capacity may be gained from the fact that nearly 3,000,000,000 tons of water will rush through these penstocks in a single year. The above view shows how "The Virginian," which is one of the world's largest and most powerful locomotives, could easily be run through one of the penstocks. On the right is a view of a 500,000-pound "needle valve," which will be used to control the flow in each of the three penstocks. So ingeniously is this enormous valve constructed, that only five seconds are necessary to completely shut off the huge flow. The design of the valve is such that it utilizes, instead of opposes, the enormous pressure of the rushing water, when it is necessary to check the flow. This is accomplished by admitting water to the inner side of the valve, so that its force will be balanced on both sides of the valve gate.

FORESTATION TO HELP CITY REDUCE INDEBTEDNESS

The town of Ilion, N. Y., hopes, by a community practice of reforestation, both to benefit its people in an immaterial way and to derive a substantial profit from it, and is already well along toward the realization of its aims. In 1910 the unproductive land that skirted its reservoir streams was planted with 5,000 pine-tree seedlings and about 3,000 spruce. In 1911, some 12,500 more were planted; in 1912, 5,000 spruce were purchased and set out, and in the following years 25,000 additional trees were planted, making a total of 50,500 trees. Some 90 per cent of these trees now live, a majority having attained a height of 14 feet, adding great beauty to a hitherto unsightly region. Within 30 or 35 years these trees will have reached commercial size, and as they are cut down, younger growths will take their place. In this manner considerable sums will be realized from the sale of the timber, and it is planned to apply these funds toward liquidating whatever municipal bonds may be outstanding at that time.

PLAN FAST AIRSHIP SERVICE NEW YORK TO CHICAGO

An overnight airship service is now being planned between New York and Chicago, as the beginning of a line of dirigibles that will operate on a scale heretofore not attempted even by Germany with the Zeppelins and Shütte-Lanz airships. After a survey of the past performances of air craft of this type, the advocates of the idea appear to be convinced that with the use of helium gas and with other protective measures, safe travel can be assured, and that it will be commercially possible to maintain service with a fleet of rigid dirigibles similar to the Shütte-Lanz type. Air terminals at which the liners would be moored to great masts and with provisions for heavier-than-air machines, would receive passengers from the smaller craft for transfer to the through-route air-ships. Accommodations for about 50 passengers would be provided and would include staterooms approximating, in size and appointments, those of a Pullman car; a dining room, an observation lounge, and a promenade deck, as well as quarters for the crew. The motors would be entirely removed from the passenger compartments so as to insure quietness and minimize vibration.



The DeHaviland Airplane Which Lieutenant Nowland Piloted in Making an Aerial Survey of the Salt Creek-Tea Pot Dome Oil Fields near Casper, Wyoming: A Film-Type Camera was Suspended Vertically in the Rear Cockpit of the Machine

THE LOG OF AN AERIAL SURVEY

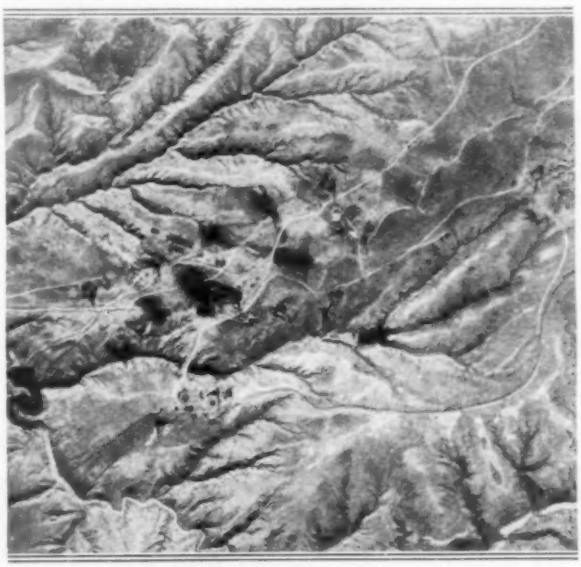
BY BOB E. NOWLAND

Lieutenant, Army Air Service

THE following account of a map-making flight was written for Popular Mechanics Magazine, at the instance of the Chief of Air Service of the War Department, by the pilot in charge of the expedition, and the illustrations are reproduced from official photographs by courtesy of that department. We are requested to mention, in this connection, that the Army Air Service is operating a school of aerial photography at Rantoul, and that full particulars may be obtained by writing the Commanding Officer, Photographic School Department, Chanute Field, Rantoul, Ill.—Editor.

AT seven o'clock on the morning of Aug. 7, 1922, the writer, as pilot, together with Master Sergeant Fred Carducci, photographer, left Fort Riley, Kansas, by airplane, for Casper, Wyo., some 600 miles away, to map, by order of the Army Air Service, the Salt Creek-Tea Pot Dome oil fields.

Our plane, an army DeHaviland with a 400-horsepower Liberty motor, was heavily loaded with camera, films, and miscellaneous equipment, but when once in the air, handled as easily as a training ship.



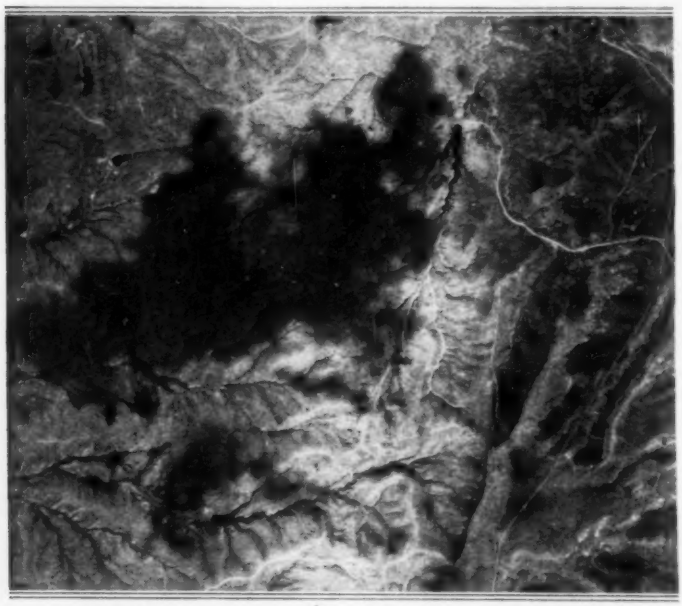
A Section of the Territory Mapped by Aerial Photography: A Close Inspection of the Picture will Disclose the Presence of 14 Oil-Drilling Rigs with Derricks

The flight to North Platte, Neb., our first stop, was made in 3 hours 25 minutes. With new supplies, we were in the air again in 20 minutes, bound without further stop for Casper, 310 miles away. As the country in western Nebraska was quite rough and unsettled, it seemed a good plan to keep in sight of the North Platte River, so that, in case of trouble, a landing could be made near civilization.

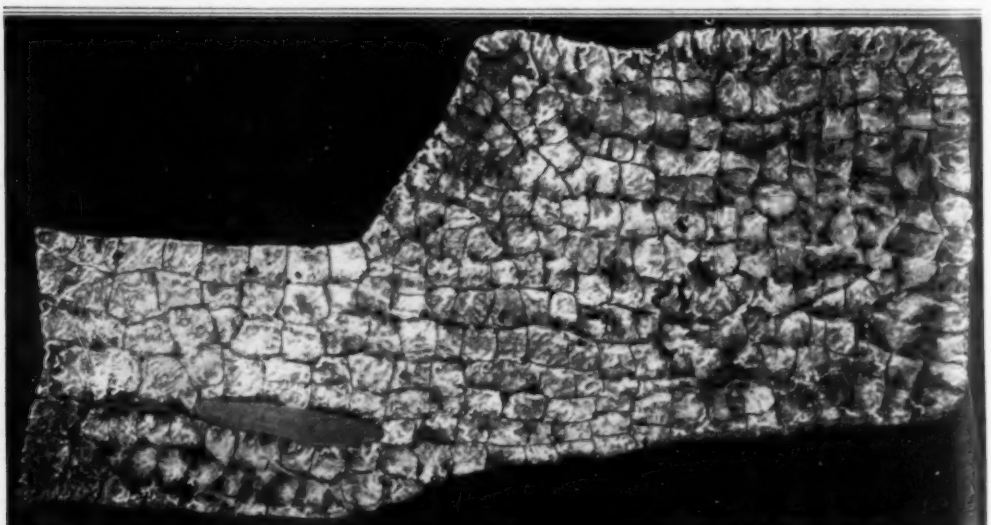
The motor was working perfectly and we seemed to be traveling with a favorable wind, as our speed over the ground figured out close to 120 miles per hour.

Just after crossing the Nebraska line into Wyoming we passed over some very bad country, but the motor was run-

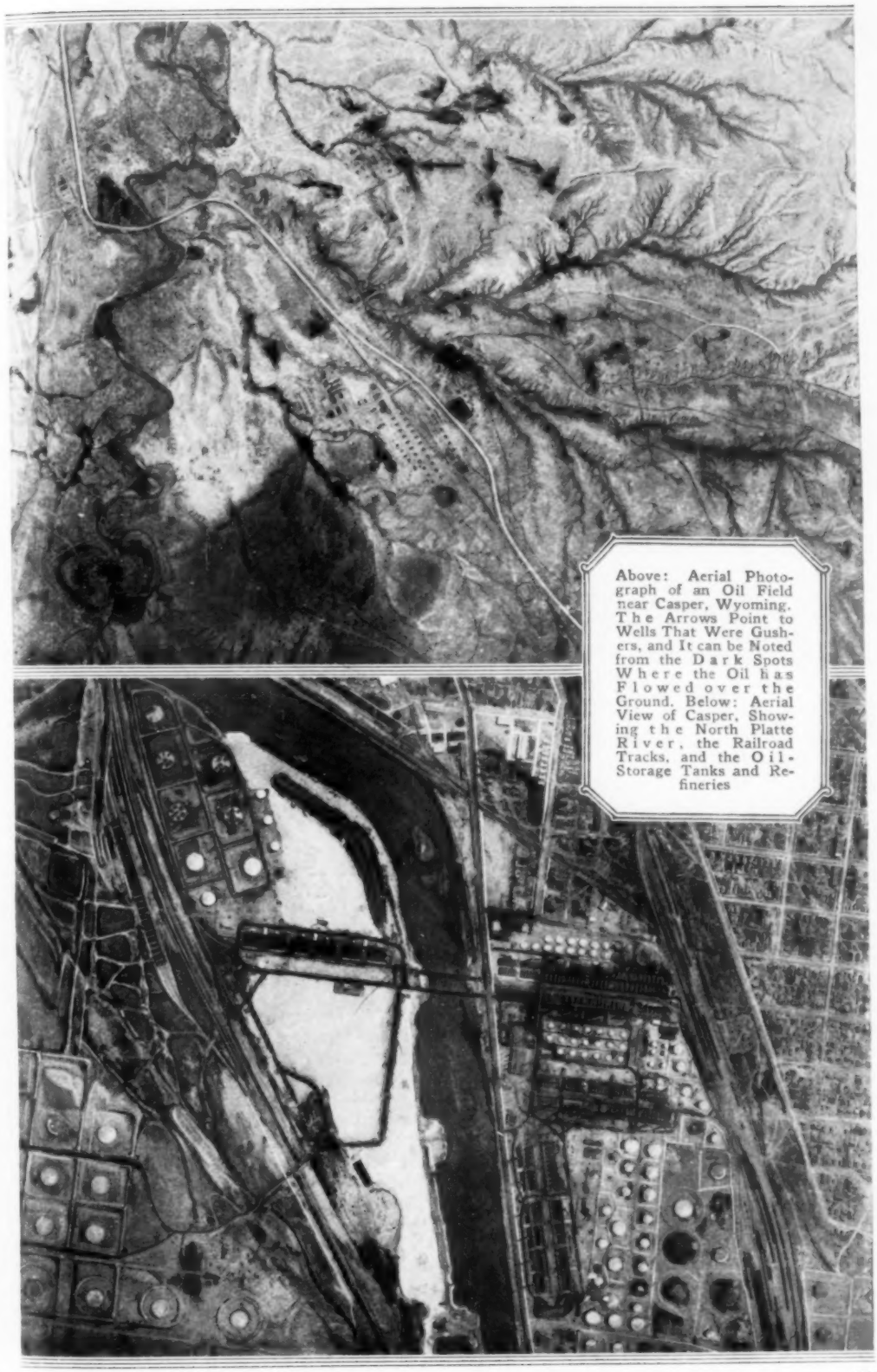
ning "sweetly," and in 3 hours 15 minutes we were over Casper. After circling the town several times, a landing was made at the local aviation company's field east of town. The representative of the Bureau of Mines met us at the field, so we loaded all our equipment into his machine and drove to town. We spent the balance of the day in getting acquainted and in studying the existing maps of the area to be photographed. These maps gave very little information, as no contour or topographical maps of this country have been made. The area to be photographed was 35 miles north of Casper, and contained about 300 square miles of fairly rough country. The elevation above sea level at this point is approximately 5,000 feet, and as we planned on flying at 10,000 feet above the ground, to get pictures of a scale of 1:10,000, it will be seen that we were in for quite a bit of high-altitude work. Our camera was of the film type, taking a picture 7 inches wide by 9 inches long, and with 100 exposures to each film. This camera was suspended vertically in the rear cockpit of the airplane, in a mounting that allows it to be kept absolutely vertical at all times. To make an exposure, the photographer has only to press a trigger; then, by turning a small handle about three revolutions, the film is wound into position, and the shutter cocked, for the next exposure. Exposures taken at 10,000 feet above the ground cover an area of 1½ square miles to each picture.



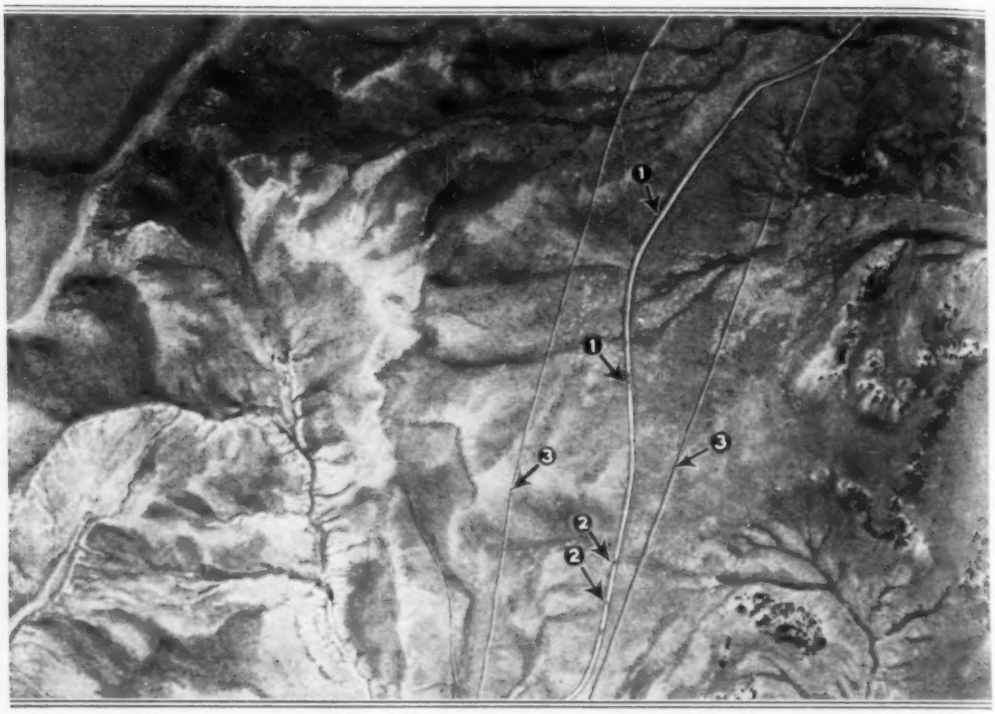
The Dark Patch Is the Shadow of a Cloud. To Avoid This Effect, the Mapping was Done before 10:00 o'Clock in the Morning



This Is a Reproduction from a Poor Print of the Finished Aerial Map Which was Completed in Four Months After the Project was Begun. Under the Old Method of Land Surveying, It would have Taken Much Longer and Cost More to Cover the Same Area



Above: Aerial Photograph of an Oil Field near Casper, Wyoming. The Arrows Point to Wells That Were Gushers, and It can be Noted from the Dark Spots Where the Oil has Flowed over the Ground. Below: Aerial View of Casper, Showing the North Platte River, the Railroad Tracks, and the Oil-Storage Tanks and Refineries



In This Aerial Photograph, 1 Indicates a Portion of the Road between Casper and the Oil Fields; 2 Points to Motor Trucks Loaded with Freight, and 3 Denotes Pipe Lines Carrying Oil from the Wells to Casper, the Nearest Railroad Point

It was decided, after an inspection of the maps of the area to be photographed, that some method of marking the boundaries of the area would be necessary, to prevent useless waste of time, film, and gasoline, so a trip to the oil fields was made by automobile, and markers were laid down at known positions around the area. These markers were made of cheesecloth, staked securely to the ground. They were in the form of a letter "L," the arms of the letter being 50 feet long and 6 feet wide. An entire day was taken up with this work, as some little difficulty was experienced in finding the corner locations.

A dark room was fitted up in a local blueprint establishment, and our tank-developing apparatus moved in. That afternoon we made a flight of 1½ hours over the area to note the position of prominent landmarks, and to see how well our cheesecloth markers showed up from the air.

As everything was in readiness, the following morning we started mapping the area. The temperature on the ground was up around 90°, but by the time we had reached our altitude, which took an hour, it had dropped to below freezing. We sat there for 2 hours 20 minutes, our teeth chattering, getting a picture every 25 seconds, as we rode up and down the 25-mile strips, until our film gave out. That afternoon and evening we developed and printed our film, and the next day laid down the prints on large pieces of beaverboard, to see how much of the area we had covered. We were trying to snap a picture often enough to get a 50-per-cent overlap, and found when the prints were down, one over the next, that we had succeeded pretty well.

The next day's flying went much as the first, only we profited by the chilly ride of the first day, and wore our heavy leather flying clothes, and were much more comfortable. It was found that, due to the white billowy clouds that formed over the area each day, our photographic efforts had to be over by 10:00 o'clock each morning, otherwise our pictures would be spoiled by the black shadows that these clouds cast on the ground.

The rest of the flying went much as the first two flights had gone: an hour to climb up, a couple of hours up and down the area, and the long glide of 40 miles back to our field. The old Liberty motor worked perfectly for the 16½ hours spent over the area, and slowly

day by day, the prints began to cover up the spots of the area unphotographed, until, on August 23, the job was completed—a total of five flights with over 600 exposures taken.

We packed and shipped our developing apparatus, and got away for home at 7:30 the morning of the 24th. This time we decided to go back by Cheyenne and Denver, so headed out over the mountains to the southeast. Cheyenne rolled by beneath us in 1 hour 20 minutes, and at 10:10 we were on the ground in Denver, taking on gasoline and oil, having covered 240 miles. At 11:00 o'clock we got under way from Denver, and at 3:00 o'clock that afternoon put our wheels down on the airdrome at Fort Riley, Kan., having covered the last 440 miles in just 4 hours.

Now came the slow and painstaking part of aerial mosaic-map making—the laboratory and assembling work. Four prints were made of each of the 600 views. These were looked over, and those of a certain uniform shade were selected. These prints were glued down to a heavy cardboard mounting, each overlapping the next until the job was completed. This map, when finished, was 13 feet long by 7 feet high, and is now in the office of the petroleum division of the Department of Interior in Washington.

From the beginning of this project until the finished article was delivered, about four months elapsed, and an area was covered which, with the old method of ground surveying, would have taken a crew of men several years to accomplish, and at many times the cost of an aerial map. The camera gives all the small detail.

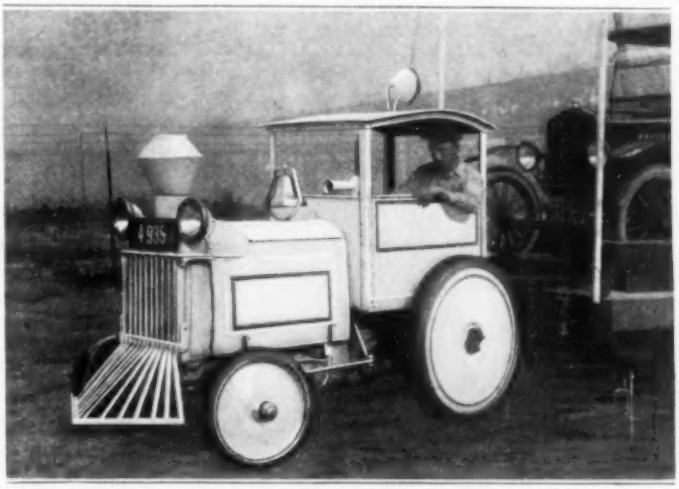
This is one of the many peace-time uses of the aerial photographic section of the Army Air Service.

NEW RADIO DETECTOR HAS IMPROVED QUALITIES

One of the most important recent developments in radio is the so-called non-interfering detector, which is said to give greater signal strength than the ordinary single-tube regenerative set. Essentially it is a vacuum tube, containing a filament, with an anode of sodium on its outer wall and with a U-shaped collector placed above the filament and facing the anode. A short length of resistance wire, in series with the filament, is cemented to the outside of the glass directly underneath the anode, and serves to maintain the anode at the proper operating temperature. It combines, in a sense, the features of a detector and an amplifier, and requires only a six-volt battery.

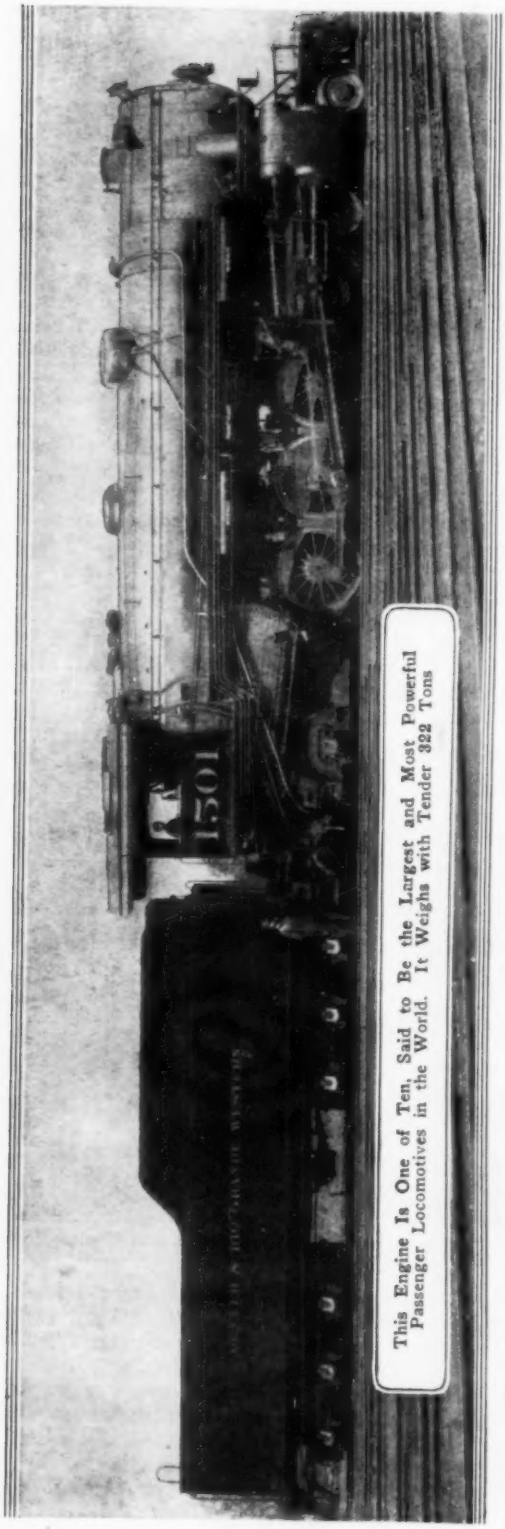
STREET "LOCOMOTIVE" HELPS ADVERTISE CAR COMPANY

A gasoline tractor, fitted up to resemble a locomotive, and used to pull a truck upon which is mounted an automobile made by the same company, is attracting attention in and about New York City. The tractor is a standard model, equipped with rubber-tired wheels, a cab and engine hood, and with headlights for night operation. As warning signals, there are both a bell and a horn. The crank, in front, is covered by a cowcatcher, hinged so that it can be raised.



Advertising Tractor Equipped to Resemble a Locomotive, and Used to Pull a Truck upon Which is Mounted an Auto Made by the Same Company

¶Extensive anti-aircraft maneuvers, in which numerous kites and balloons will be shot at from Fort Totten, will be held this summer to determine the requirements for adequate air protection of New York City.



This Engine Is One of Ten, Said to Be the Largest and Most Powerful Passenger Locomotives in the World. It Weighs with Tender 322 Tons

WORLD'S LARGEST PASSENGER LOCOMOTIVES

The 10 largest passenger locomotives ever constructed, both in weight and tractive power, for use on mountain or plain for any railroad in the world, have been placed in operation on the mountain divisions of the Denver and Rio Grande Western Railroad.

The monster engines are 95 feet in length, 11 feet 2½ inches wide, 16 feet high, and weigh 644,600 pounds, with loaded tender. The wheelbase, including the tender, is 82 feet 2¾ inches, the drive-wheels are 63 inches in diameter, and the cylinders have a diameter of 26 inches and a 30-inch stroke. The weight on the drivers, of which there are eight pairs, is 257,500 pounds. The tender has a capacity of 14,000 gallons of water and 22 tons of coal. When the locomotive is working to maximum capacity, 8,000 gallons of water are evaporated each hour and 5½ tons of coal are burned. When first put into service, the latter part of 1922, the locomotives were used in freight service until broken in. They now haul 16-coach trains over the continental divide, running from Pueblo and Denver, Colo., to points in Utah. They each replace two of the former largest mountain-type engines used in the Rocky Mountains. A speed of 60 miles an hour can be developed with a train of 16 steel coaches, which aggregate 2,000,000 pounds in weight, so that the whole train weighs 2,644,600 pounds. The total length of such a train is 1,200 feet, or nearly a quarter of a mile.

ELECTRIC BABY PROVES ATTRACTIVE SIGN

At Piccadilly Circus, London, there has long been a free entertainment at night, and the pavement on the opposite side to the Monico is filled, two deep, with people gazing at the electric signs which proclaim glitteringly the excellency of something or other. But to the number has just been added the cleverest electric sign ever seen. It is a performing baby. There never was such a baby. At first it is glum and bad-tempered. Electric tears pour down its cheeks, electric furrows appear on its brow, its electric mouth opens. It is obviously yelling with rage. Then a bottle of somebody's milk appears, and the baby's face is wreathed in electric smiles, it winks an electric eye, and its one lock of electric hair stands on end with joy. It is drawing all London

WIDE WORLD PHOTOS

Left: Edward Page Gaston, on the Left, and Canon Gedge, at the Spot Where Pocahontas' Grave is Supposed to Be. Right: Tablet in Memory of Pocahontas in New St. George's Church, Gravesend. This Is One of Several Memorials in the Church

AMERICAN SEEKS TO LOCATE POCAHONTAS' GRAVE

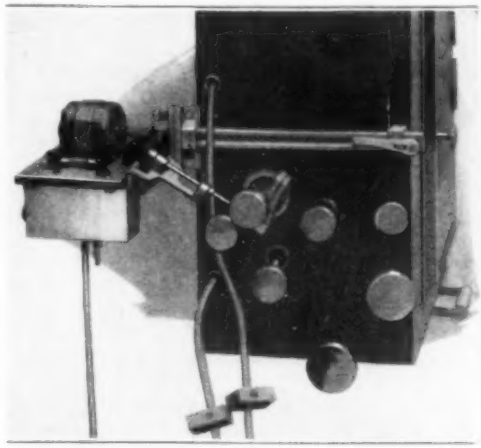
Although it is generally known that Pocahontas, the Indian princess whose memory is linked with that of Capt. John Smith in the school histories, married an Englishman and died in England in 1617 as she was about to return to America, not much is known regarding her last resting place. According to old records, she was buried under the old church in Gravesend, which burned in 1727. Now an effort will be made by Edward Page Gaston, an American, to find her grave. He has permission from Canon Gedge, of St. George's church, to dig on the site of the old church, but before he can go on with the work he must have a permit from the British government. The new Gravesend church contains memorials to Pocahontas in the form of a pulpit made from Virginia wood and given in 1904 by the state of Indiana, a stained-glass window given by women of Virginia, and a tablet, reading in part, "Gentle and humane, she was the friend of the earliest struggling English colonists."

CONCRETE REINFORCING BARS INDICATE OWN SIZE

Deformed reinforcing bars for concrete work with the deformations indicating the size of the bars, in eighths of an inch, have been found of benefit in saving labor, and in insuring accuracy in sorting, storing, and placing. The figures used are symbolic, 3 denoting $\frac{3}{8}$ inch, 5 standing for $\frac{5}{8}$ inch, and so on.

CONTINUOUS AUTOMATIC ARC FEED FOR MOVIE PROJECTOR

A motor attachment for use with any motion-picture projecting machine has been placed on the market which is designed to provide automatically a continuous carbon feed to the arc. The entire unit can be clamped to the projector, and, through reduction gears to the carbon feed, operates the latter at a ratio of 204,800 to 1. Power is furnished by a small 115-volt motor, whose speed is governed by a resistance coil

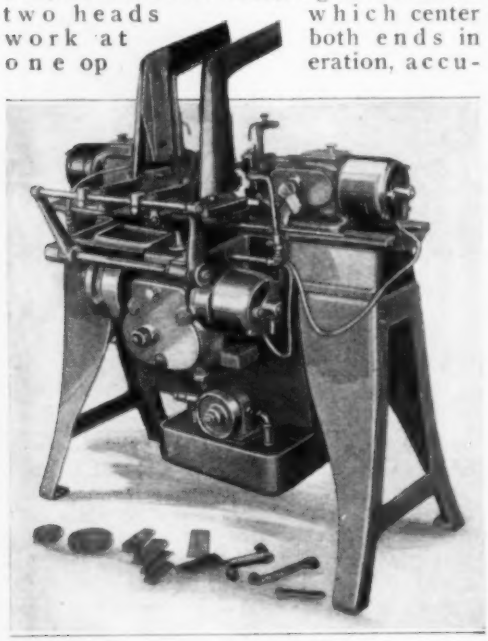


A Continuous Arc-Feed Attachment for Projecting Machines Which Relieves the Operator Entirely of Hand Feeding

mounted directly beneath it. With this arrangement, it is possible to speed up or slow down the motor as the space between the carbons demands.

MACHINE CENTERS AND DRILLS AUTOMATICALLY

Designed for use in quantity production, an automatic centering machine has two heads which center work at both ends in one operation, accurately and rapidly. The machine has also an automatic drill-feed mechanism operated in conjunction with a magazine. Clamping of the work is done mechanically, so that after it is set up, it is only necessary to replenish the magazine, and take away the finished parts. The work is removed from the magazine by transfer slides, is placed in the vise, clamped, centered, and then released into the work box, without any attention from the operator. The feed to the drills is automatic, by means of the same cam that operates the transfer slides. This cam is driven by a small motor, and a set of change gears adjusts the drilling time.



This Machine, Designed for Production Shops, Automatically Centers and Drills Work That is Taken to Other Machines for Various Finishing Operations

UNUSUAL RUBBER PRODUCT FILLED WITH GAS

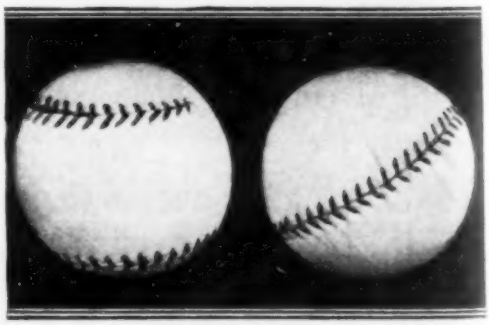
A new form of rubber impregnated with nitrogen gas, possesses such unusual properties that it promises to become an important product of the rubber industry. It is so buoyant as to support five times its weight in water, and a specimen, left for five months in sea water, indicated no increase in weight. Owing to the presence of the multitude of nitrogen-filled cells, its resiliency is far greater than that of solid rubber. In evidence of this, a ball subjected to a pressure of 32,000 pounds, sufficiently reasserted itself in 24 hours, to hit the ceiling when bounced from the floor. It is either hard like brick or soft and resilient, depending upon the processing it receives.

AIRPLANE SPEED AND HEIGHT RECORDS MADE IN FRANCE

Flying over a four-kilometer course at an average speed of 234⅔ miles an hour, Sadi Lecointe, on February 15, near Marseilles, broke the standing record of 224⅓ miles an hour made by General Mitchell of the U. S. Air Service on Oct. 18, 1922. Lecointe was flying a Nieuport - Delage "Sesquiplan," fitted with a 320-horsepower Hispano-Suiza engine. On February 11, Casale, flying a Spad-Herbemont biplane, motored with a radial air-cooled engine, reached a height of over 23,600 feet with a useful load of 550 pounds.

NEW BASEBALL COVER CUTS MANUFACTURING COST

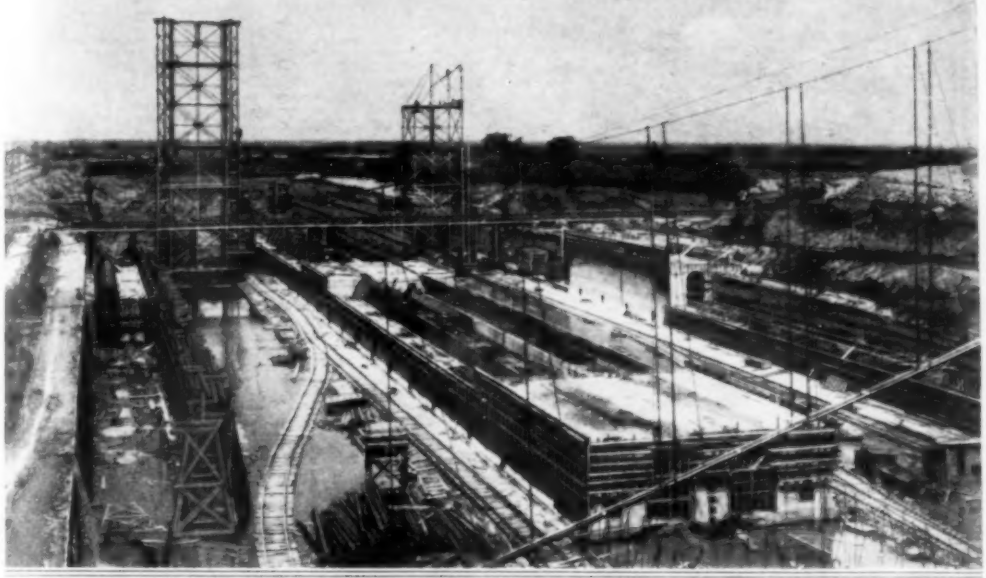
A one-piece baseball cover has been invented which requires only 114 stitches. The seam runs around the ball in such a manner that its two ends are parallel on one side of the ball with a diagonal joining them on the other side. Because of the design, it is thought that new curves in pitching may be possible. The principal object, however, is economy in manufacture. It is estimated that from an ordinary horse hide from three to six covers more can be made.



Front and Back Views of the Recently Invented Baseball Cover, Which Is in One Piece, and Requires Only 114 Stitches

THE WELLAND CANAL

By George F. Paul



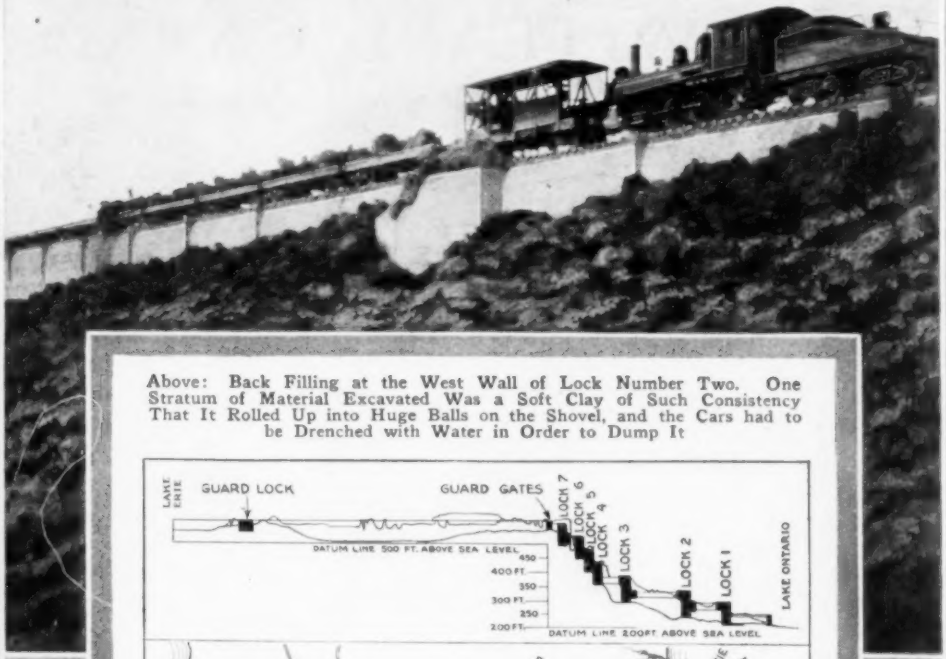
A View during Construction of Lock Number Six of the New Welland Ship Canal, as Seen from the Upper West Entrance Wall: Each of the Locks, of Which There Are Seven, Has a Usable Length of 800 Feet, a Usable Width of 80 Feet, and a Depth of 25 Feet

THE government of Canada is actively pushing the work on the new Welland Ship Canal, which is declared to be the largest earth-moving project now under way in the world. Centuries ago, Nature hewed the mighty Niagara gorge to join Lake Erie with the lowlands to the north. Today steam shovels are eating their way through this same ledge to link the two lakes and provide a series of safe steps by which loaded ships may quickly descend or climb back up.

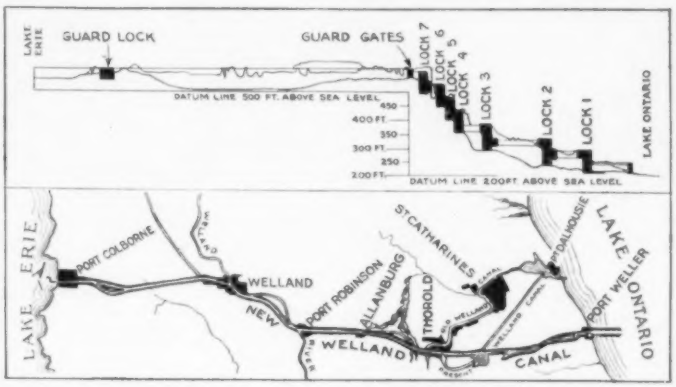
The new Welland Canal may rightly be said to rival the Panama Canal. American builders overcame a difference of 85 feet between the levels of Gatun Lake and the ocean by building three locks at each end. The Welland Canal is only half as long as the Panama Canal, but—what is of more importance—Lake Erie is not a mere 85 feet higher than Lake Ontario, but 326½ feet higher. In other words, the builders of the Welland Canal have had to provide for a vertical lift nearly four times as great as the engineers of the Panama Canal.

This is the fourth canal project undertaken by the Canadians to span the Niagara peninsula. This canal cuts through the valley of Ten Mile Creek, 10 miles west from Niagara River. It will have a total length of 25 miles, and will follow a practically straight line. It rises from Port Weller, on the Ontario side, to Thorold, where it crosses the present canal; here the level of both will be at an elevation of 382 feet above sea level. From there on to Allanburg, the new canal will straighten the present unsatisfactory alinement, crossing the old canal near the latter place, where both canals will be at an elevation of 568 feet, or the extreme low-water level of Lake Erie. The course of the present canal will then be followed to Port Colborne, the southern terminus on Lake Erie.

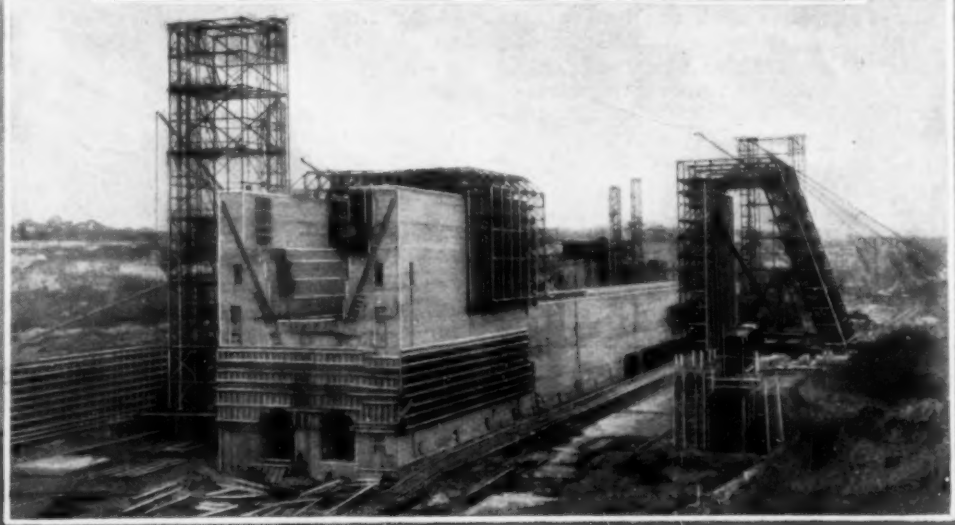
The big locks, of which there are seven, are all located within a few miles of Lake Ontario. Each lock provides a lift of 46½ feet, or nearly twice the lift of the Panama Canal locks. The builders are going down to bedrock for these locks, and are constructing them of concrete throughout. The canal will be excavated so as to have a bottom width of 200 feet with two-to-one slopes. For the present the excavation work will go

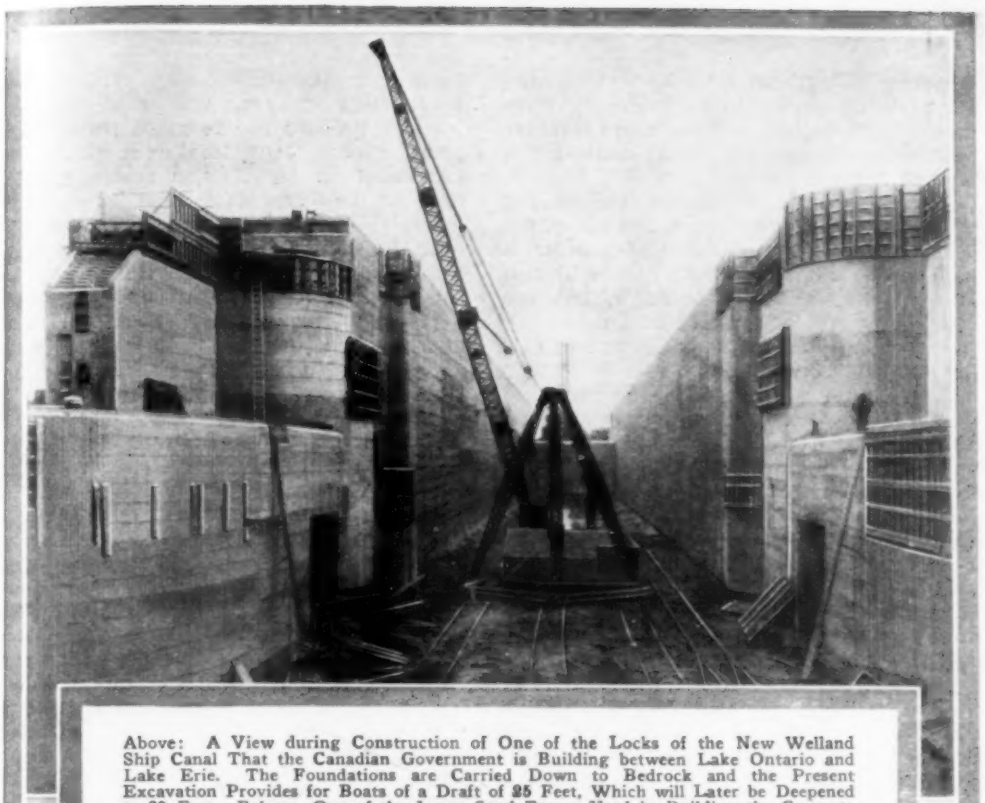


Above: Back Filling at the West Wall of Lock Number Two. One Stratum of Material Excavated Was a Soft Clay of Such Consistency That It Rolled Up into Huge Balls on the Shovel, and the Cars had to be Drenched with Water in Order to Dump It

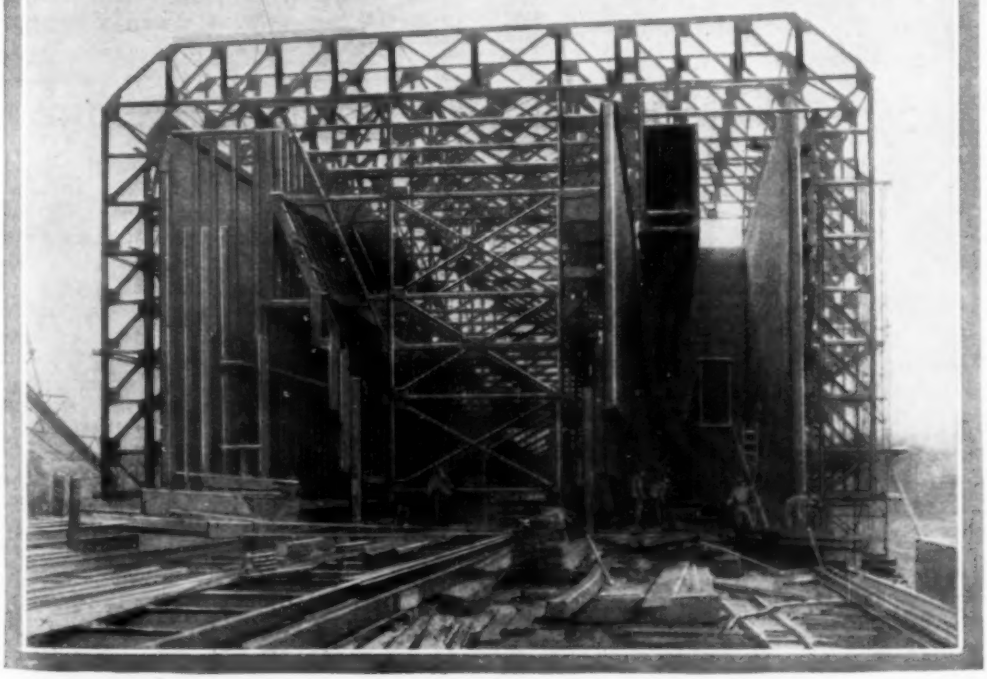


Above: At the Top of the Diagram is Given a Profile of the New Welland Canal, While below It Is a Map Showing the Course of the Canal When Completed. Below: View Showing Completed Section of Center Wall of Lock Number Six





Above: A View during Construction of One of the Locks of the New Welland Ship Canal That the Canadian Government is Building between Lake Ontario and Lake Erie. The Foundations are Carried Down to Bedrock and the Present Excavation Provides for Boats of a Draft of 25 Feet, Which will Later be Deepened to 30 Feet. Below: One of the Large Steel Forms Used in Building the Concrete Work for the Locks



down to a depth of only 25 feet. However, the intention is to make enlargements at some future time, and therefore all the structures are to be built for a 30-foot depth.

The project was started before the World War. At that time, the estimated cost was placed at $50,000,000. Now it is believed that the total cost will run close to the $100,000,000 mark, but the Canadians are determined to go on with the work and push it through to successful and early completion.

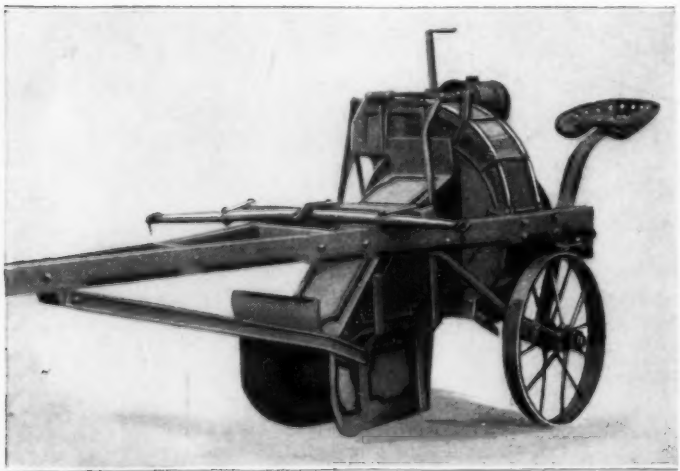
When this new canal is in working shape, lake boats of a maximum draft of 25 feet can pass safely to Lake Ontario and proceed to Prescott, there to unload for reshipment in 14-foot draft vessels to Montreal. This new arrangement will give the grain producers of the Northwest direct transportation by water for a total distance of 2,339 miles to the Straits of Belle Isle. There is but little doubt that within a few years Canada and the United States will reach a joint agreement for the improvement of the St. Lawrence River, so that the Welland Canal will be the great connecting link between the Great Lakes ports and the seaports of the whole world. There is great optimism in Canada over this outlook, some of its leading engineers firmly believing that within five years work will be started on the St. Lawrence waterway.

One unusual feature should be noted in commenting on this canal, and that is that in the first sections the material excavated is like plastic clay. It stretches much like rubber, and can even be worked up into the form of rope. This peculiar consistency makes it difficult to handle it in bulk. The steam shovels load on the dump cars great balls of this material about 6 feet in diameter. At first the contractors used straw to keep the clay from sticking to the bottom of the cars. Then they hit upon a better plan—they turned the hose on the sides and bottom of the cars before loading, and also turned the hose on the slopes where the cars were being dumped. When the embankments were thus drenched they became slippery skids, down which the sticky balls of clay took a rapid slide.

Another noteworthy feature of the new canal is the guard lock to be installed at Humberstone, about three miles from Port Colborne. The water level of Lake Erie varies from 568 feet to 579¾ feet. In order to care for these variations, which are due largely to high winds and storms, the guard lock is to be provided.

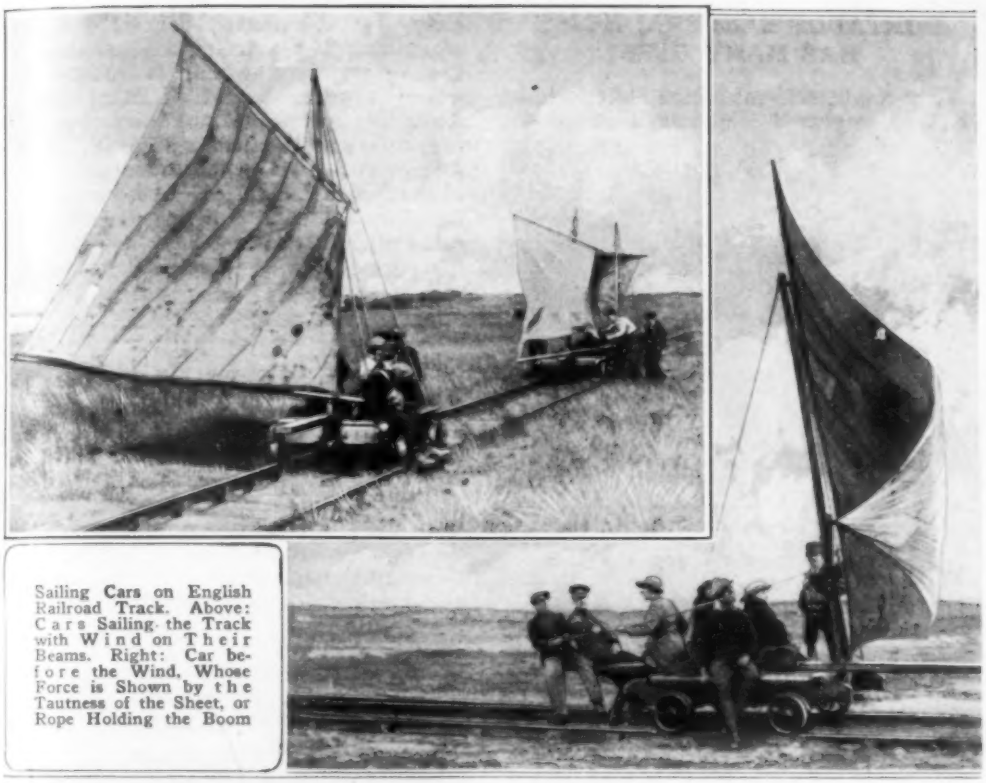
The construction figures for this canal run up into the millions. For instance, 6,740,000 cubic yards of rock excavation will be needed, about one-half of which has been completed, and there are 40,200,000 cubic yards of earth excavation, according to careful calculations. The structures call for the placing of 2,850,000 cubic yards of concrete, and nearly 20,000,000 pounds of steel will be required for reinforcement.

BOLL WEEVILS DESTROYED BY VACUUM MACHINE



The Machine Which Uses the Vacuum Principle for Sucking Boll Weevils and Their Eggs from Cotton Plants: It Is Adjustable for Height, to Facilitate Operations on Rolling Ground

An interesting application of the vacuum-cleaner principle has been made by an Iowa manufacturer in a machine for destroying the boll weevil on cotton plants. It may be used also in killing potato bugs and other pests. The machine straddles the row, and the huge rotary fan in a circular housing sucks the insects into a canvas bag from the plants, which are brought into the suction area by sidewalls extending close to the ground. The machine may be raised and lowered for plants of different sizes.



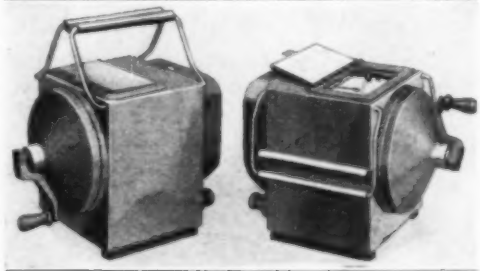
Sailing Cars on English Railroad Track. Above: Cars Sailing the Track with Wind on Their Beams. Right: Car before the Wind, Whose Force is Shown by the Tautness of the Sheet, or Rope Holding the Boom

SAIL-RIGGED HAND CARS RIDE ENGLISH-COAST RAILROAD

Sailing a railroad track on small cars is the novel means of transportation used by battery officers and men, lighthouse and coast guards, and visitors, to travel from Spurn Head, the utmost point of a narrow spit of land on the east coast of England, to the town of Kilnsea, about four miles away. With a mast, or sometimes two, stepped on small hand cars and sails rigged up, the cars make good time.

PORTABLE INSULATION TESTER IS VERY LIGHT

A small, light insulation tester has been developed recently whose portability affords a wide range of application in the industrial field and inspection service. The instrument consists of a direct-reading ohmmeter and a hand-driven direct-current generator, substantially mounted together in a cast-aluminum casing. The ohmmeter scale reads from 0 to 100 megohms, and is viewed through a protected glass window in the top of the case. "Line" and "earth" terminals are provided which are protected from external injury by their convenient location below the ohmmeter housing. These are also provided with a "guard" circuit, so that errors due to surface leakage are eliminated. The voltage rating of the instrument is 500, and its dimensions, with handles down, are only 5½ by 7¾ by 6¼ inches.

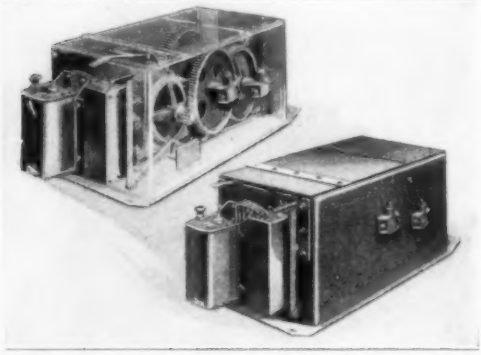


Left: The Tester with Handles Up, Ready to be Carried About. Right: Ready for a Test, the Hinged Door being Raised for Taking Readings

¶An advertising card so painted on one side that, when properly folded, it becomes a toy model of their regular automobile bus, is being distributed by British manufacturers.

PORTABLE ELECTRIC HOIST HAS MANY USES

A portable, self-contained electric hoist has just appeared which is intended for



Above, Phantom View of the Portable Hoisting Unit, Shown Complete Below: Both Driving Gears and Pinions are Machine-Cut from Electric Steel

use on construction jobs or in industrial plants. It is also adapted for skidding crates and general warehouse handling, and even for shifting freight cars on sidings. A steel casing completely envelops and protects the hoist mechanism and motor, which has a rating of 5 horsepower at 1,200 revolutions. The lifting capacity of the unit is 1,500 pounds at a hoisting speed of 100 feet per minute, and its over-all dimensions are only 2 by 2 by 4½ feet.

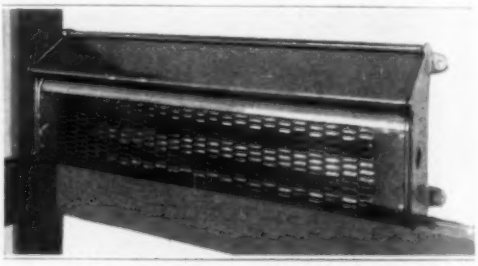
RESERVE ALASKAN OIL FIELD FOR NAVY'S FUEL

More than 35,000 square miles in the northwest of Alaska have been set aside as an oil reserve to insure fuel for the navy, by a recent order of President Harding. The petroleum possibilities of the reservation, which is mostly flat, grassy tundra, devoid of other vegetation, are practically unknown, but they are sufficient to attract some 50 private interests to whom allotments, totaling about 125,000 acres, have been granted for development. For years seepages of oil along the seacoast have indicated the existence there of large oil fields.

Map Showing Location and Relative Size of the 20-Million-Acre Tract Set Aside in Alaska as an Oil Reserve for the Navy

SPECIAL ELECTRIC HEATER FOR TICKET BOOTHS

A convenient type of electric heater has been placed on the market recently for use in ticket booths. It is 20 inches long, and can easily be attached to the sides of the booth with screws. Resistance units are mounted inside, and the proper amount of heat is insured by a three-heat snap switch. The heater is of all-steel fireproof construction, and may



In This New Type of Electric Heater, Which can be Used as a Footrest, Danger to Footwear is Eliminated by an Air Space That Protects the Resistance Units

also be used as a footrest with perfect safety. Current may be tapped from any 110 or 220-volt circuit.

FAMOUS BELLS OF NOTRE DAME TO BE ELECTRIC-TOLLED

The successors of Quasimodo, Victor Hugo's fictitious bellringer of Notre Dame, will give way soon to the inroads of 20th-century mechanical efficiency. An electric motor is to be installed for tolling the first bell, which will be in the nature of a try-out before the other bells are similarly equipped. The introduction of modern appliances in the ancient cathedral is the result of the high post-war wages demanded by the ringers. The position as head ringer, of which there are several, has, at least in one case, been held by successive generations of the same family.

AIRPLANE-HEIGHT INDICATOR FOR NIGHT FLYING

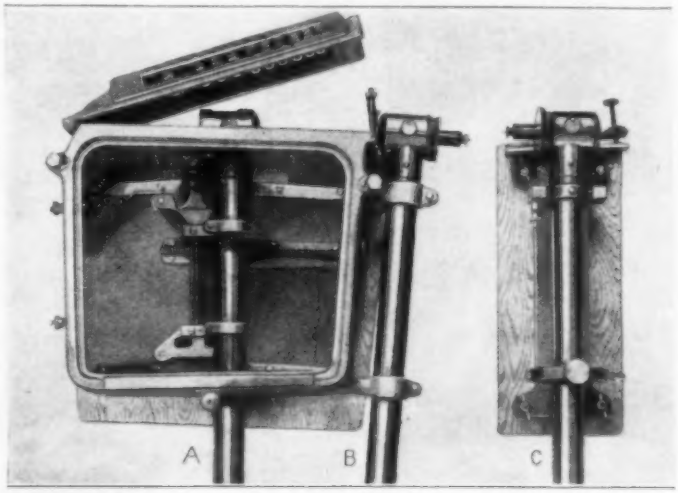
Night-flying problems are now engaging the attention of aeronautical men. To be successful, flying by night must be made as safe as flying by day, otherwise the gain in speed over other methods of transportation would be of no benefit.

One of the unsolved problems of night flying has been the determination of the plane's height above the ground, especially when landing. An answer to this problem has been worked out in an altitude indicator recently tested by the Bureau of Standards.

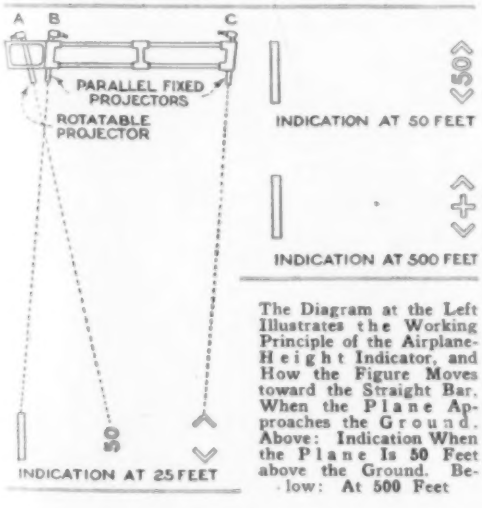
This indicator consists of three tubes, each with an incandescent lamp at one end. Two of the tubes are parallel and stationary, while the third can be moved within a prescribed angle. This tube is equipped with a scale of numerals which are projected on the ground or water, just as a picture is projected on the screen. One of the stationary tubes projects two figures in the shape of rectangular brackets, and the other a straight bar of light.

To determine his height, the pilot turns the movable tube until it projects a number between the brackets. This number will be his altitude.

The device indicates any height between 50 and 500 feet. If the plane is over 500 feet above ground, a cross appears between the bracket-shaped figures, and when it is less than 50 feet high, the number 50 moves toward the bar of light. The latter is simply a guide for determining the height when the machine is nearing the ground.



Apparatus for Night Indication of Airplane's Flying Height: Each of the Three Tubes Has a Small Incandescent Lamp at the Upper End, Which Throws an Illuminated Image upon the Ground. B and C Are Stationary, While A Is Movable and Projects a Number from the Scale Directly above It



The Diagram at the Left Illustrates the Working Principle of the Airplane-Height Indicator, and How the Figure Moves toward the Straight Bar, When the Plane Approaches the Ground. Above: Indication When the Plane Is 50 Feet above the Ground. Below: At 500 Feet

MOTORCYCLE IS "MADE UP" TO PHOTOGRAPH WELL

A motorcycle with an extraordinary color design, an entire lack of nickel-plated parts, no reflecting surfaces, and miscellaneous trimmings of weird colors, has recently attracted attention on the streets of Los Angeles. The explanation of the odd design is simply that a motorcycle manufacturer is following a practice old in the motion-picture industry in having produced for advertising purposes a machine having a color scheme that will photograph as its stock models appear to the human eye. In motion-picture work, a white tablecloth, for example, makes a glaring white when projected on the screen. A light-yellow tablecloth, however, gives a natural white. So, wishing to have a machine that would photograph naturally without retouching, this and other color variations were taken into consideration, and the peculiar motorcycle mentioned was developed.

WORKING RADIO-ANTENNA HAT WORN AT FASHION SHOW

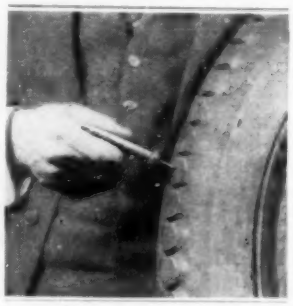
One of the fantastic hats worn at a recent millinery show in Cincinnati had two aerial towers running up a few inches on either side, with the usual arrangement of wires strung across the top, and connected to a radio-receiving set which the wearer carried. It is said that the set "tuned in" with local stations readily.

TRACTOR LIFTS ITSELF BY "BOOT STRAPS"

An odd demonstration of the drawbar pull of a farm tractor was staged recently, in which the delivered power of the engine was used to lift the tractor from the ground, literally by its own "boot straps." A special scaffold was erected for this purpose, and two sets of suspending straps, acting as belts, enveloped the rear drivewheels, to which they were secured. One set of straps then passed around the front wheels, and was secured to the top of the scaffold frame, while the other set of straps, after passing around the drivewheels in a counterdirection, was carried up to the frame at the rear. Although the differential was not locked, the tractor retained its balance when free from the ground, and gently raised or lowered itself with 12 men on board.

NO VALVE NEEDED IN NEW TYPE OF INNER TUBE

The claim is made for a newly invented inner tube that it does away with the use of the valve in inflating, air being introduced to the tube with a small hollow needle. When the tube is fully inflated and the needle withdrawn, the tube automatically seals the puncture with a substance it contains. Before the tire is mounted, it is necessary to fill the opening in the rim for the valve with a rubber plug.



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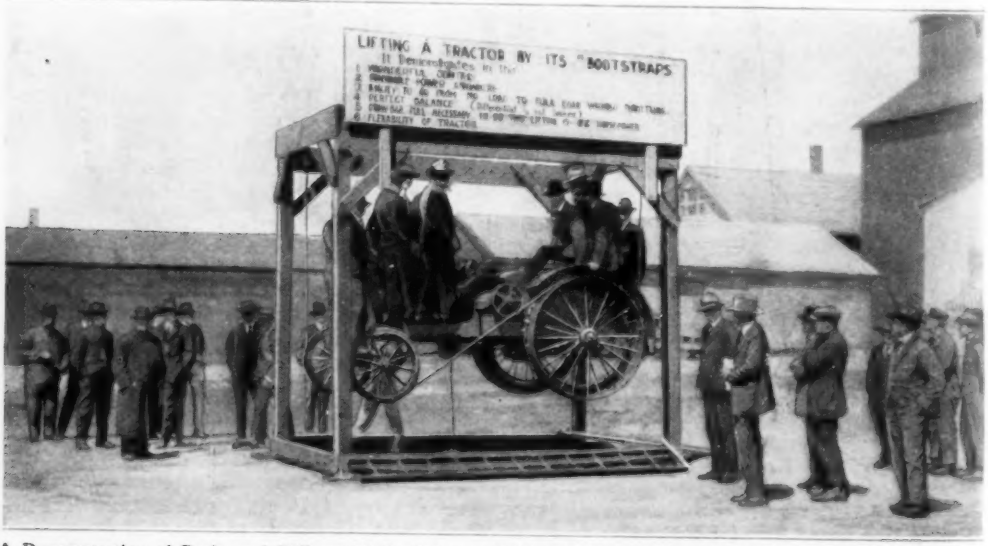


A Demonstration of Brake and Differential Qualities, as Well as Delivered Power, of a Farm Tractor: Even with Differential Unlocked, and with a Load of 12 Men in Addition to Its Own Weight, Power was Uniformly Received at the Driving Wheels, Resulting in Even Balance

Geysers at the Base of Mount Lassen, California, Which are to be Tamed and Trained to Furnish Steam for Engines; Other Geysers at the Foot of Mount Helena will be Similarly Exploited

GEYSERS HARNESSED TO FURNISH POWER

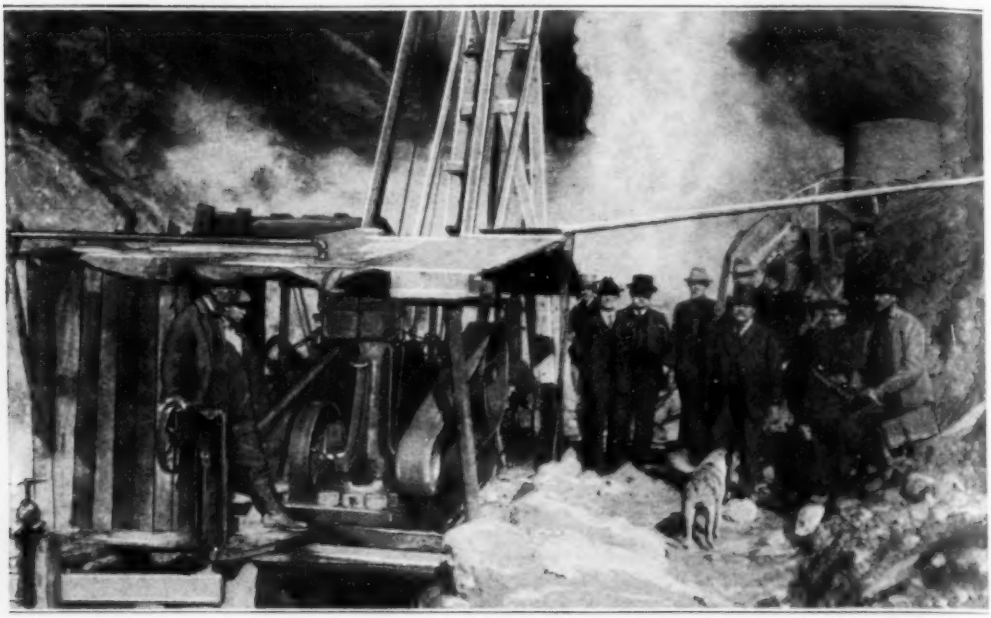
BY H. H. DUNN

THE largest group of geysers in California, in Sonoma County, is being harnessed to the steam engine to provide power. At the middle of February, one geyser had been tapped and connected with a steam engine, where it yielded 150 horsepower, which was put to work immediately drilling the "well" with which another geyser is to be tapped, and likewise connected with another engine. The ultimate object of the project is to provide steam enough from the whole group of geysers to drive turbines in a power house, thereby supplying electric current, at a cost price below even that at which hydroelectric power can be produced, to a dozen large towns and cities in the northern and central parts of the state.

Only about one-half of the steam available from the first geyser has been taken, owing to errors in drilling the first well and to lack of experience in keeping the steam confined and hot between the geyser and the engine. Plans under which the work is now being done provide for the taking of approximately 90 per cent of the steam from each geyser tapped in the future. Estimates based on the production of the first geyser are that approximately 1,500,000 horsepower can be obtained from this group.

Though volcanic heat has been harnessed in Italy, this is the first time that power has been taken from the subterranean fires of the New World, and the only question which arises is as to the period of time over which these geysers will continue to furnish steam at pressure and heat sufficient for the operation of engines or turbines. The geysers at this point have been pouring forth their torrents of superheated steam and boiling water for some 200 years, since white men first knew of them, and have been increasing, rather than diminishing, in volume. The same statement is true of other geysers at the foot of Mt. Helena, near Calistoga, and at the base of Mt. Lassen, the recently active volcanic cone, farther north, where other interests are preparing to put the steam to work.

The method of taking the steam from the geysers is comparatively simple. A well is driven at an angle, from a point some hundred or more feet from the mouth of the geyser, to strike the throat



The First Engine to be Operated by Steam Direct from a Geyser in the United States: It is Installed at The Geysers, Sonoma County, California, and Takes Steam from One Geyser There, Developing 150 Horsepower

of the geyser at a depth of 200 to 400 feet, this depth depending on the solidity of the earth and rock formation surrounding the geyser.

Closely following the drill goes the 2-inch pipe, and when this tube breaks through the side of the throat of the geyser, the steam, under considerable pressure, follows it as an outlet, rather than the rougher and usually twisted natural vent. The upper end of the 2-inch pipe is then capped, an exhaust and a safety valve put on, and the steam conveyed in a smaller pipe to the engine. Greater power can be obtained, if necessary, by laying the pipe in a large tube, through which is allowed to flow the abundant hot water from the geyser, while still greater pressure can be maintained by superheating the steam at the engine. These things, however, have not been done, since the steam derived from the first geyser has been of sufficient pressure and hot enough to more than supply all power necessary for drilling operations on several other adjacent geysers.

At first it was thought that all the geysers were connected, that all were vents from the same subterranean lake of boiling water, and that by finding the proper location, and tapping this source of supply, the steam could be collected in one pipe and thus only one well would have to be drilled. Experiments showed, however, that if all the geysers came from the same source, that source must be at such great depth that it could not be reached with any ordinary drill. It was then decided to take the steam from each geyser, allowing it to rise in its own vent to a point within 200 to 400 feet of the surface, as mentioned above, and there remove it. This has proved successful.

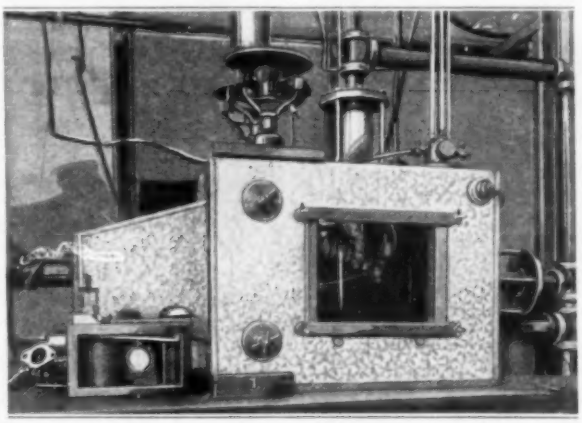
GIANT BLIMP NOW BUILDING TO CIRCLE WORLD

The large dirigible airship "ZR-1," now under construction for the U. S. Navy, will be sent on a trip around the world when completed next summer, and may later go to the north and south poles, according to plans recently announced. This ship, and the "ZR-3," that is being built in Germany for the navy, the first rigid dirigibles for this country, represent the most improved features in airship design, and it is expected they will be the forerunners of a large fleet of dirigibles. They will be filled with helium, the noninflammable gas that is available in large quantities only in the United States. For long-distance sustained flights and for carrying heavy loads, the rigid dirigible is regarded by many as the logical type of craft.

TESTING APPARATUS TO IMPROVE CARBURETORS

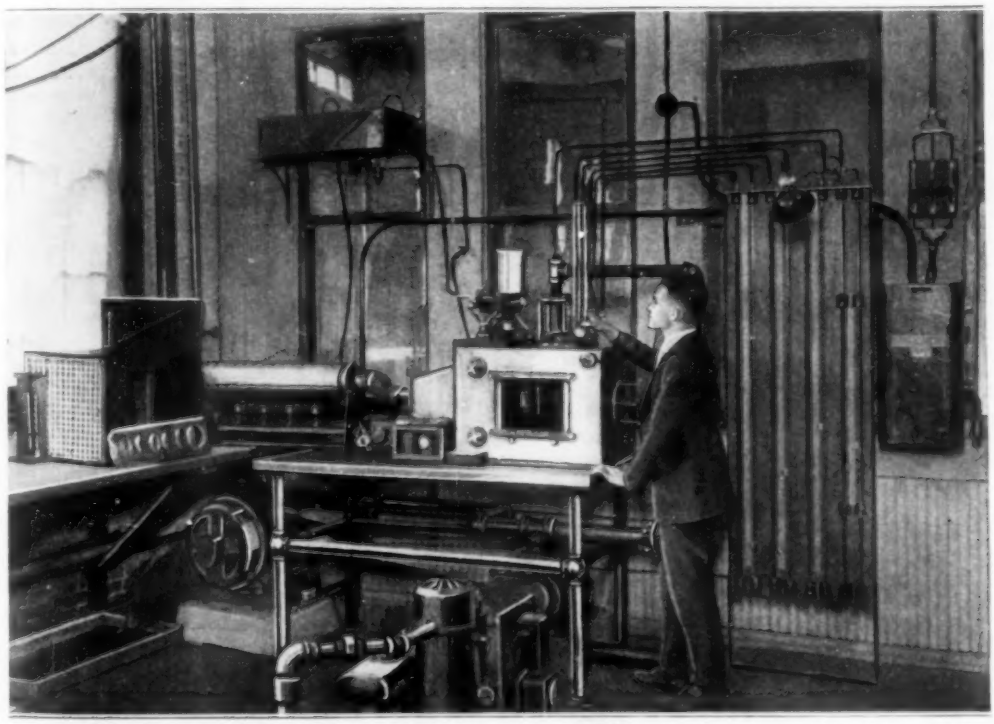
By J. C. ALLEN

IN an effort to increase the mileage obtained by automobiles on a gallon of gasoline, extensive experiments are being conducted at Purdue University, and the indications are that proper carburization will make an improvement of about 25 per cent. The apparatus is built with the idea of establishing the best methods of fuel preparation and of obtaining information concerning fuel-air ratios for efficient engine performance. Primarily, the test plant consists of an air chamber, an electrically driven vacuum blower, an air heater with motor-driven blower, a fuel-flow meter, a fuel-weighing apparatus, a manometer board, and an air-flow control. The air chamber is designed to withstand high vacuums for altitude work and vaporization research, and provides mounting for side or top-outlet carburetors, connections for manometers, air inlet, and an inspection door. A gas heater is arranged for heating the air before it enters the chamber, to temperatures as high as 500° F. The fuel is measured by a flow meter, or by direct weighing for more accurate results.



Close-Up of Carburetor-Testing Apparatus Which has been Worked Out to Give Results Quickly and under Conditions Actually Existing on an Engine

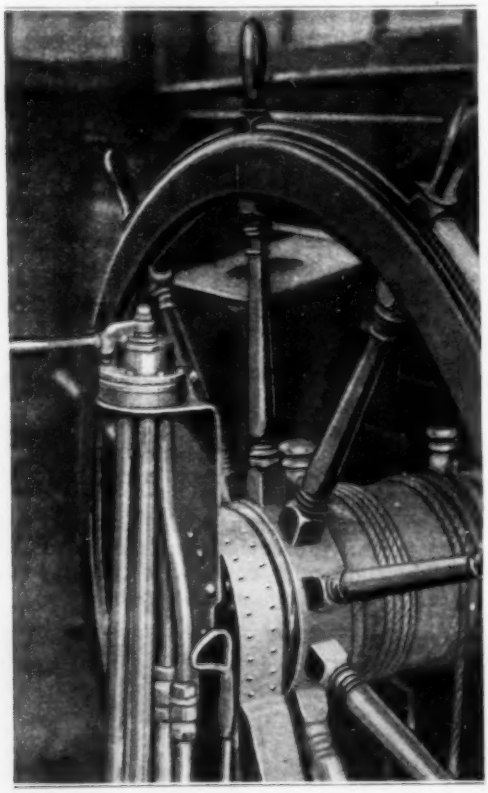
Everything is arranged so that a complete test of the carburetor can be made quickly and under conditions existing on an engine driving an automobile.



General View of Testing Apparatus Built with the Idea of Reducing the Gasoline Consumption of Automobiles, by Furnishing Carburetor Designers with Information as to the Fuel-Air Ratios of an Engine

COMPRESSED AIR OPERATES SHIP'S STEERING GEAR

Air control for steering vessels has been used successfully on the Pacific coast in an experimental way, instead of the standard wheel or tiller, and one boat on Puget Sound has been equipped with it. It has to recommend it, lightness, simplicity, and ease in keeping in repair. Two cylinders just behind the pilot house, filled with compressed air, regulate the movements of the tiller. As air is released from a cylinder by a lever in the pilot house, the tiller moves in that direction. The cylinders also act as buffers to take up shocks to the rudder.



The Controller for Compressed-Air Device, Which Actuates the Steering Gear and Moves the Rudder, is Shown Here Immediately behind the Wheel

Connected with the Controller in the Wheelhouse, These Cylinders on Deck Actuate the Tiller of the Rudder

NIAGARA FALLS NEW PARK TO BENEFIT RESIDENTS

The city of Niagara Falls, for many years one of the world's most famous tourist cities, is now to possess a 300-acre recreation park for the enjoyment of its own residents. Permission to expend the needed money has already been granted, and the probability is that the preliminary work will soon be under way. It is planned to have the park on the east side of the city, extending from the north boundary 2½ miles to the Niagara River at the south. Playgrounds, picnic groves, a permanent band stand, an outdoor stage, a wading beach for children, a swimming pool, a lake, and boating lagoons, are among the details which will be incorporated.

DESK CLOCK SOUNDS ALARM TO JOG OWNER'S MEMORY

For the busy man to whom time is valuable and keeping engagements promptly is important, a memory-jogging clock has been devised to set on his desk. Opposite the quarter hours on the dial, small cards are inserted in slots just outside the dial, and when the cards are in the slot, the clock's alarm rings at the quarter hour. Memoranda of the dates to be kept may be written on the cards. The clock is finished to be an ornament to the desk.

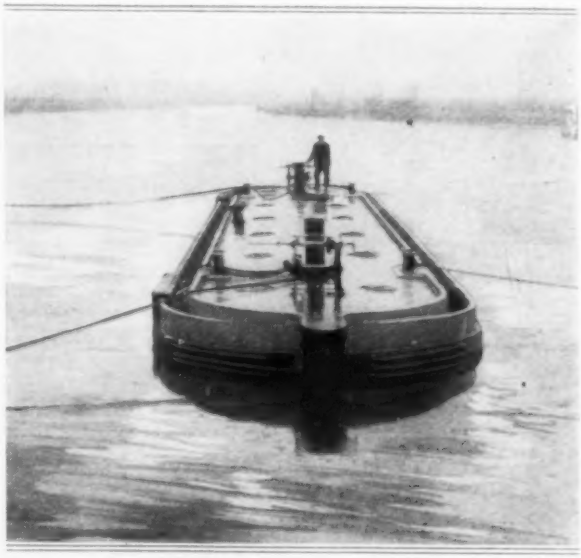
¶A refuge is now being planned, on the Island of Andros, in the Bahama group, to save from extinction the last of the flame-colored flamingoes, which once were so numerous in Florida and the Bahamas. Only 1,000 or so remain where 20 years ago more than 12,000 are known to have flourished.

FLOATING CAISSON SERVES AS FIRE STOP

BY R. FRANKLIN MUNDORFF

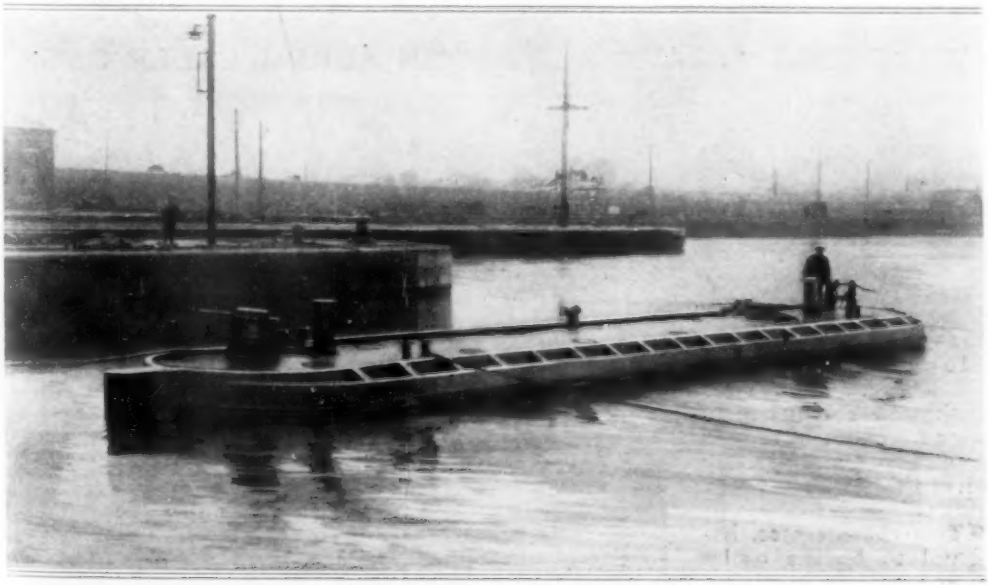
LARGE quantities of petroleum and oil have been imported into England via the Manchester Ship Canal during past years. Hitherto, however, the canal company has not permitted the importation of oil having a flash point below 73° F., owing to the want of a safe place to moor the vessels while discharging their cargoes. This difficulty has been overcome by the provision of a separate dock and discharging equipment in an isolated location, in which the vessels can be shut off from the canal by means of a floating reinforced-concrete caisson—a precautionary measure in case of fire and escape of the fluid.

The dock, which is 600 feet long and 100 feet wide, admits vessels of 30-foot draft, and the entrance is 80 feet wide. It is placed at a convenient angle to the canal to give easy access to the ships. In each of the entrance piers is provided a vertical U-groove, into which two projections at either end of the caisson fit. Thus an oil fire—if one should break out—could not spread by water beyond the limits of the dock itself.



Head-On View of the Concrete Floating Caisson Which, When Swung into Place at the Entrance to the Dock, will Serve to Stop the Spread by Water of an Oil Fire

The caisson, it may be explained, is a bargelike vessel, with its semicircular ends terminating in the substantial stem and stern posts mentioned. Its length over all is slightly more than 82 feet, and the beam 12 feet, while the depth from

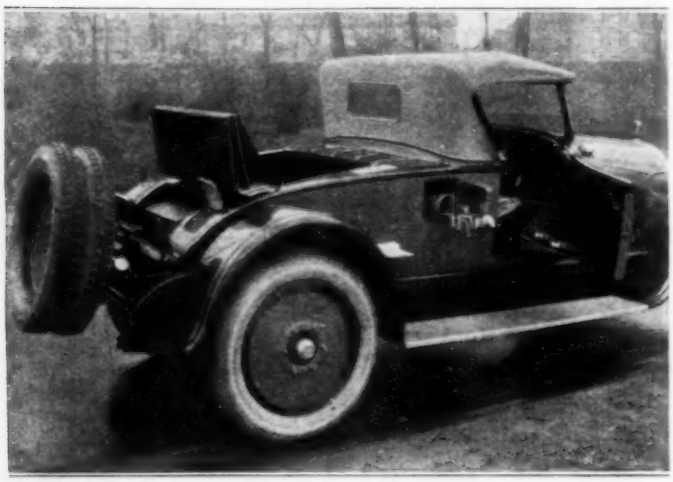


In This View, Note the Projection at the Stem. This, and a Similar One at the Stern, Fit into Two Vertical U-Grooves in the Entrance Piers. The Over-All Length of the Vessel Is Slightly More than 82 Feet, the Beam 12 Feet, and the Depth from Deck to Keel About 10 Feet

the crown of the deck to the keel is about 10 feet. A fore-and-aft central wall, together with six transverse bulkheads, divide the boat into 14 water-tight compartments. All these sections are provided with manholes with air-tight covers, a scuttle plug, and a sounding pipe.

For adjusting the water ballast, and for pumping out the ballast chambers, each compartment has a sluice valve connected to a hand pump on deck. If desired, the sections may be dealt with singly or any number at a time. Two winches and four mooring bits complete the deck equipment.

Timber fenders bolted to a reinforced-concrete counter, carried by wings springing out from the upper parts of the sides, at the water level, form another interesting detail. The total weight of the vessel without ballast is 125 tons.



This New Roadster Has a Lunch Kit and an Ice Chest, an Emergency Rear Seat for Two, a Locker for Golf Equipment, and a Disappearing Compartment for Liquid Refreshments

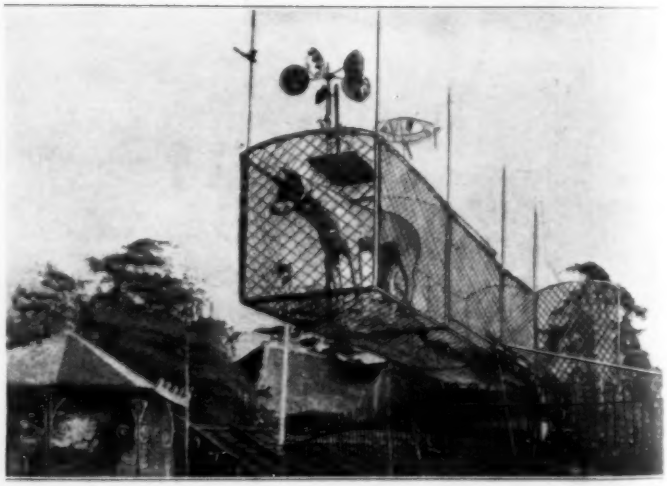
ROADSTER HAS GOLF LOCKER AND OTHER FEATURES

A small compartment, or buffet, for liquid refreshments, a locker for golf equipment, an ice chest, and a lunch kit are found in a newly designed sporting roadster. The buffet is within the right door, the golf locker runs crosswise behind the seat and has a door opening on the right side, and both ice chest and lunch kit are arranged in the end of the rear deck. There is also an emergency rear seat for two.

WATCHDOG "TRAVELS BEAT" IN AERIAL-CABLE CAGE

Similarly to the way in which packages are carried in stores in traveling overhead baskets, a dog makes the circuit of his master's grounds in London at regular intervals in a traveling elevated cage. The dog appears to understand the responsibility of his place and is keenly on the lookout. From his position he becomes aware of an intruder's presence and speedily gives the alarm.

¶Two rhinoceroses, believed to be the only mated pair in captivity, have been presented for a new Chicago zoo.



English Watchdog, in Traveling Aerial Cage, Protecting Property: Note the Dog's Alert Attitude as He Watches for Intruders on His Master's Grounds

Above: A Scene at the French Glider Camp at Biskra, Algeria, in the Sand Hills at the Foot of the Atlas Mountains. It Is Here That a New World's Record for Motorless Flight was Made. Right: Descamps Standing beside the Glider with Which He Recently Established a New Endurance Record

NEW GLIDING RECORD MADE BY FRENCH PILOT

With a sustained flight of 8 hours 40 minutes, Warrant Officer Descamps, of the French army, established a new endurance record for motorless planes. The flight took place at the French glider camp near Biskra, Algeria, over rolling desert sands. In another recent flight there, Descamps covered a distance of over three miles measured in a straight line. Now that the motorless plane has demonstrated its ability to stay in the air, attention is turning toward developing the distance-flying feature.

Ordinary house closets are being lined with cedar by a southern concern. This comparatively new arrangement is much more convenient than the usual cedar chest, and is equally effective as a moth deterrent.

NEW ELECTRODE ALLOY CUTS COPPER-REFINING COST

The introduction of a new alloy for making one of the electrodes used in the electrolytic refining of copper, resulted in such savings that a South American copper company reduced the cost of production in 1922 to two-thirds the cost for 1921, and to nearly one-third the 1915 figure. The anode is made from the new alloy, which consists essentially of copper and silicon. The savings result from a reduction in the losses of electric current and those due to contamination of the product from the ferrosilicon and lead electrodes previously used.

"TROUBLE LIGHT" ARRANGED ON PAIR OF GOGGLES

A pair of goggles with an electric light so arranged between the glasses that it focuses in the direction of vision, has been made to aid motorists and others, who occasionally need a light that will permit the free use of both hands. The current is supplied by a small battery carried in the vest pocket, or in some other convenient way. The outfit may also be useful to linemen, gas inspectors, and firemen.

The Light between the Glasses of These Goggles is Arranged to Focus in the Direction of Vision. At the Right is Illustrated One of the Uses for Which the Lamp is Particularly Adapted

SKIERS TOWED BEHIND PLANE AT 60 MILES AN HOUR

Traveling over the snow on skis behind an airplane is the latest in outdoor sports, to which some Long Island boys were treated the other day at a demonstration of a small airplane. In the open field, the pilot was able to keep his plane as close as 5 feet above the ground, and at times towed the skiers along at a speed of 60 miles an hour. To further demonstrate the unusual qualities of the craft, it was piloted almost vertically down the side of a 40-foot embankment, without turning over. The machine, as used during this demonstration, was equipped with skids for landing gear.

ALL-YEAR WILD-FLOWER SUPPLY IN "ROCK GARDEN"

IN order to supply students of botany with wild flowers for study, Harvard College has built a "rock garden" under glass where flowers are grown, so that they may be available at any time of the year, instead of in spring and summer only. As nearly as possible, the flowers are grown under natural conditions, and many foreign species are also raised here. With the present garden as successful as it has proved itself, another and a larger rock garden is under construction to meet growing demands, which will provide for thousands of additional plants.

DRILL DIAMONDS AND DIAMOND DRILLING

BY CHARLES NICHOLLS WEBB

THE log of the prospector never fails to reward the seeker for romance. Even that of the present-day iron-ore explorer whose equipment is elaborate, and who resembles not in the least the pack-carrying pioneer, furnishes a thrill occasionally without the slightest intention.

For example, take this entry in the log of a Mesaba drill contractor:

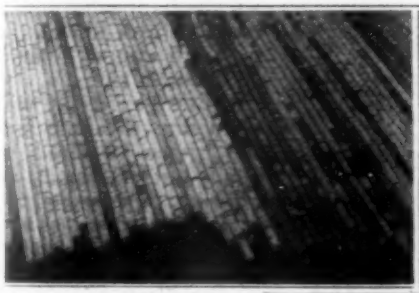
"September 7—9. Advanced 33 feet and then lost another bit in the hole."

A brief matter-of-fact statement, meaning little to the average reader—not much more significant than "Encountered bad weather," in the seaman's chronicle—is it not? Yet, a loss no greater, under different conditions, would be recorded in glaring headlines, with much desirable publicity for a musical-comedy queen.

To the man making the entry it means that some $4,000 worth of diamonds lie at the bottom of a hole, 2 inches in diameter and possibly 1,000 feet deep. It means that days, probably weeks, may be spent in fishing for that handful of precious Brazilian carbons. That is one phase of diamond-drill exploration on the Mesaba and Vermilion ranges of northern Minnesota.

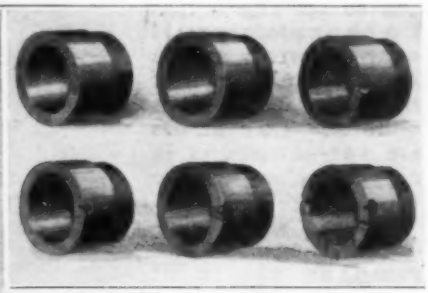
tion of the deposit underfoot. Some day, a cutting edge will be found which can be substituted for diamonds, and the state of Bahia, Brazil, will then lose its most important industry. From all reports, Bahia needs the diamond industry to insure its future prosperity.

Black diamonds are sometimes harder than the brilliant or crystallized diamond. Technicians explain the difference in the varieties by saying that the Brazilian stone is "opaque and amorphous." Natives of the La Chapada and Lavras districts in Brazil mine the stones from alluvial deposits in much the same manner as gold is mined in the placer fields of California. They sell their finds to the agents of exporting firms in Bahia, who send them to the London, Paris, and New York markets. The stones are found in sizes ranging from small fragments up to 100 to 500 carats. One stone, found in 1895, weighed 3,078 carats, and was broken into pieces suitable for diamond-drill work by the purchaser, who paid $32,000 for it. At the present time, it would be worth nearly $400,000. Black diamonds are seldom black. They range in color from black to gray, the prevailing tone being a dark brown.



Rows of Cores Which have been Drilled with Diamond Bits: The Cores Vary in Length but Are All About ⅞ Inch in Diameter

This Is a View of a Diamond-Drilling Outfit, with Its Supporting Derrick, Taken in the Lake Superior Iron Region of Minnesota



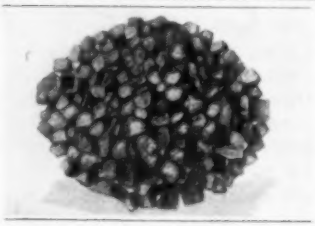
Showing the Successive Stages in Preparing a Bit for Setting with Diamonds, Beginning at the Upper Left of This View with a Blank Bit

There are other methods of testing and proving the extent of ore bodies. There are other methods of drilling besides the one necessitating the use of diamonds, but there is no other way of drilling through hard ore and rock and securing a core which shows, layer upon layer, the formations and do their mining with the most antiquated tools imaginable.

In Bahia the mining is done entirely by the natives, the *garimpeiros*, who either work for themselves or on shares with the owners of the claim. They live in squalid huts

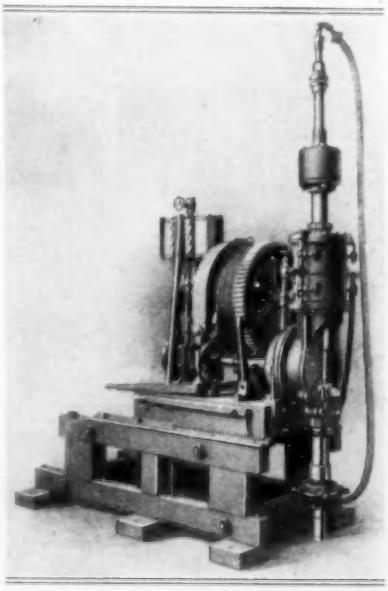
A short-handled hoe to stir the dia-

mond-bearing gravel, a crowbar to pry up stones or break down banks, an iron hook on a pole to remove material from under stones or from otherwise inaccessible cracks, wooden basins of different sizes for final washing and concentrating the gravel, a sieve of some kind for sorting, a hammer and drill for the work of blasting—these include nearly every essential of a diamond miner's equipment. From this land of the crudest mining methods and through the hands of brokers and various agents, the diamonds travel to fields where different metals are mined by the most modern and scientific processes.



How an Unusually Large Black Diamond was Split Until Ready for Use

When the stones are purchased, they are split and usually cubical in shape, with sharp-pointed corners, and it is necessary to place them in the hands of an expert diamond setter who can mount them in a blank bit without breaking them, and who can so set them that the sharp edges will wear off evenly and so that the strain on all of the stones in the bit is uniform. The stones are set—sometimes in copper packing—in the cutting edge of the bit, which is a small cylindrical arrangement that removes a core of approximately 15/16 inch in diameter from the ore or rock through which it bores.



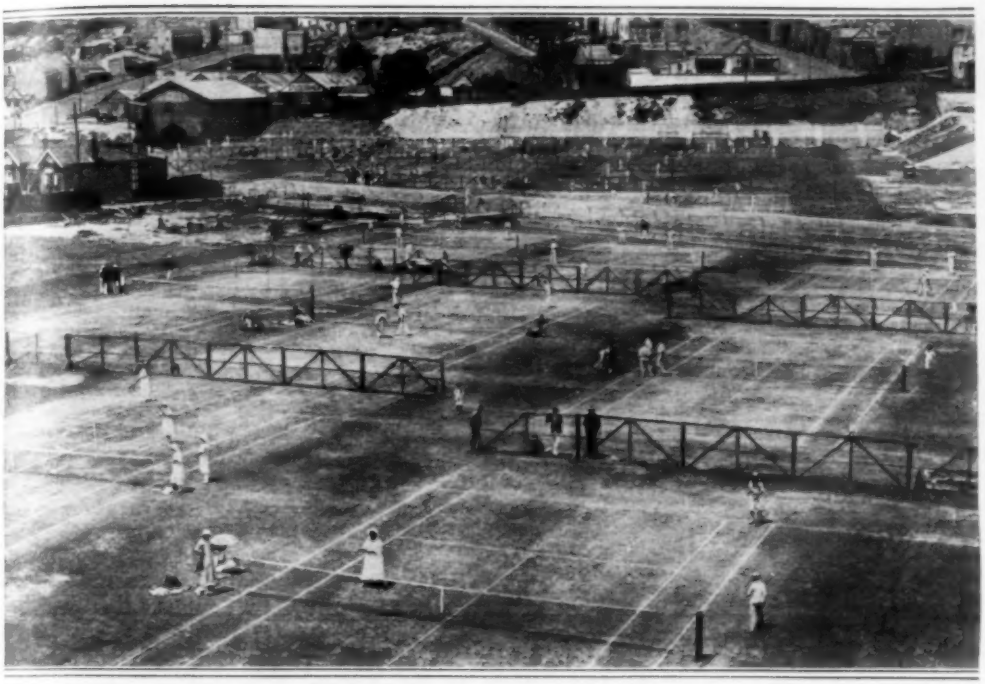
A Diamond Core Drill: Its Use Is the Only Known Method of Securing a Stratified Core of Tough Ore Which Reveals the Formation

Where one drill is on the job, the setter is usually the foreman. In any event, the foreman is responsible for the diamonds. In the morning, when work is begun, he turns over a bit already set, to the drill runner. The runner can tell from the character of the rock and the manner of the cutting, how long a bit should be run. In some formations, it can be used only through 6 inches or 1 foot, and, in others, as much as 20 feet before it is necessary to pull it up and exchange it for another bit. When it is finally turned back to the foreman or setter, the stones are cut out and weighed in a delicate balance to determine the loss for that run. Then they are reset to be used again. Wear of $2 and $3 a foot is reported sometimes. Stones are often used until they are reduced to 1/8 carat and even less.

Used stones are considered of more value than new ones, for the rough corners have been worn off and the hardness and the texture have been definitely proved, whereas new stones, despite the closest scrutiny and tests, often go to pieces quickly. The trials and vicissitudes of diamond drilling are many. Sometimes a drill rod parts. This means a fishing job with special tools. Diamonds very seldom fall out of their settings if reasonable care is used. If they should happen to break loose, a wax-filled impression cup will serve to recover them.

Oftener a bit will drop into the hole and the time required to fish it out may be a few hours or it may be several weeks or even months. It is all a part of the day's work to the diamond-drill prospector. He expects to lose diamonds and he loses them in plenty. He drills patiently for weeks at a time for their recovery and piles up costs in four figures for his company. And at the end of that time, he closes his logbook with the following entry, just as laconic but no less significant than the one quoted before:

"December 24. Broke pinion tooth and delivered hole to company to finish, the lost bit having been recovered."

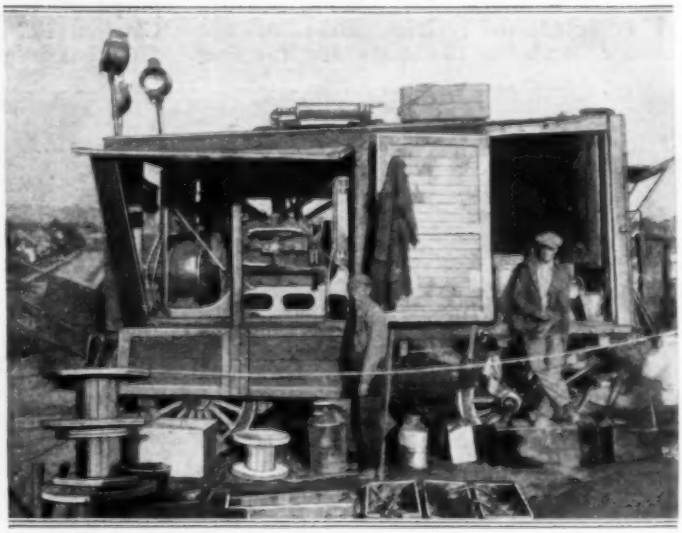


CITY OF TENNIS COURTS BUILT FOR AUSTRALIAN PLAYERS

As many as 50 tennis games may be in progress at the same time on the courts of the White City Tennis Club, the largest in Australia, and one of the largest clubs of its kind in the world. The grounds now occupied by this organization were previously the site of Sydney's White City, an amusement resort—with numerous scenic railways, merry-go-rounds, and other attractions—corresponding to White City in Chicago, or Luna Park, at Coney Island. It is said the courts have proved popular with Australia's champions, many of whom practice there.

CIRCUS-LIGHTING PLANT HAS LARGE CAPACITY

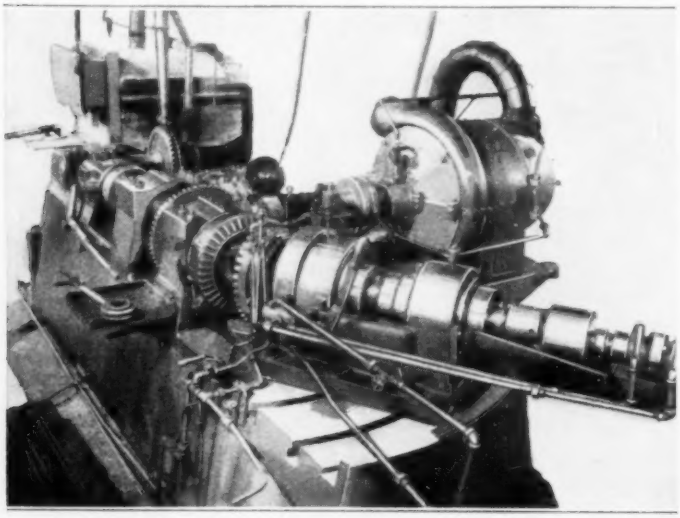
An electric-lighting plant, similar to those used by the army and navy for emergency light and power during the late war, has been adapted for circuses, and is mounted on an ordinary horse-drawn circus wagon. The outfit consists of an automobile-type gasoline engine which drives a generator. A switchboard for controlling the lights is also erected on the wagon. Heavy cables lead from the switchboard to batteries of floodlights at the top of the "big tent" and sideshows, the generator having a capacity of approximately 1,000 medium-sized floodlights.



Electric-Lighting Plant Mounted on an Ordinary Horse-Drawn Circus Wagon, Which Supplies the Energy for Approximately 1,000 Medium-Sized Floodlights: It is Driven by a Gasoline Engine

HOT-ROLLED GEARS PRODUCED BY NEW PROCESS

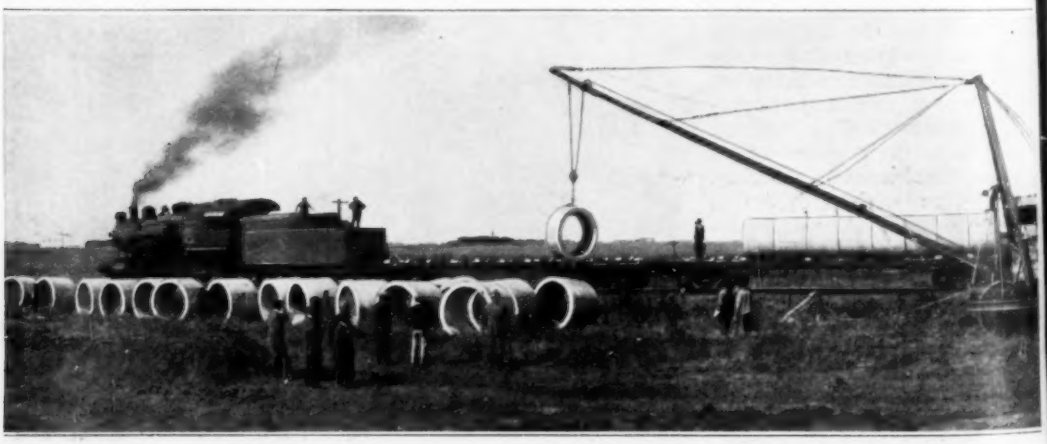
The production of accurately formed gears has long been a difficult manufacturing problem on account of the inherent defects common to all gear-cutting and grinding machines. A new method has now been devised for shaping accurate tooth profiles, in which a hot plastic blank is rolled in forced contact with a forming master gear. Power is transmitted through two other gears, in order that the shaping gear may not transmit any driving power to the plastic blank and thereby cause tooth distortion. To build up the structure and profile absolutely symmetrically on both sides of the teeth, the master gear is oscillated by repeated reversals of the direction of rotation. This is accomplished automatically by electric-control apparatus connected to the motor. The effect of these reversals, while the blank is plastic, is to work and knead the metal into proper form and to give a polish to the tooth surface, practically forging the teeth. The spindle shaft is adjustable lengthwise, to accommodate different thicknesses of blanks.



A Machine for Producing Accurately Formed Gears by Hot Rolling: Power is Transmitted through the Two Bevel Gears at the Ends of the Spindle Shafts. The Plastic Gear Blank and the Forming Gear are Rigidly Mounted between Them, in Forced Contact with Each Other, and the Former is Kneaded into Shape

BIG TILE IN DEEP DITCH TO RECLAIM IOWA LAND

JOINT drainage operations which are expected to reclaim some of the richest lands in the state for farming purposes, are in progress by the city of Clarion, Ia., and Wright County. The ditch has an average depth of 16 feet, and

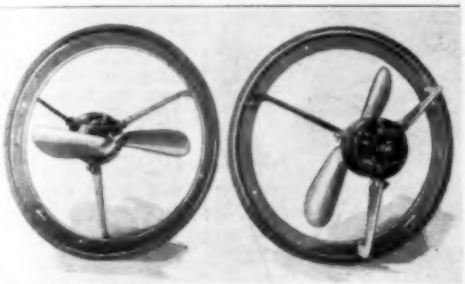


Unloading Mammoth Sections of Drain Tile for Iowa's Deepest Ditch: At the Left the Derrick is Lifting Sections Tile Lie on the Cars like Sections of a Tunnel, Large Enough for a Man to Walk Upright It is Subject to Overflow, and Large-Scale Operations

in places it is 23 feet deep. It is three miles long. What is said to be the largest drain tile ever used in Iowa—perhaps in the Middle West—will carry the water. These tiles are 56 inches in inside diameter, with 5-inch walls reinforced with mesh wire, and are made in 4-foot lengths. The tiles were unloaded from cars with the aid of an excavating machine having a 50-foot boom.

ELECTRIC FAN USES ALUMINUM AIRPLANE PROPELLER

Something entirely different from the ordinary wall type of ventilation fan has been placed on the market. The new fan is 16 inches in diameter, and is fitted with a miniature reproduction of an airplane propeller, cast of aluminum and highly polished. Although designed to run at a much higher speed than the multiblade fan, its operation is claimed to be more

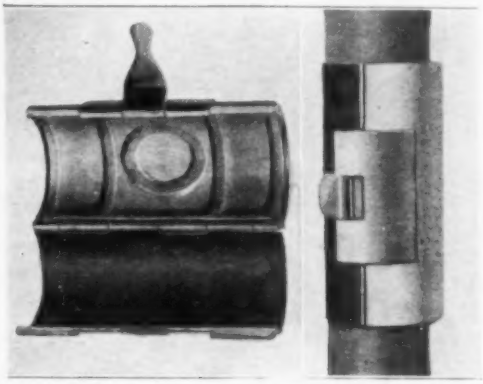


This Fan Uses a Single High-Speed Blade, Made of Highly Polished Aluminum, and Is Almost Noiseless

quiet, and to result in handling a larger volume of air. The fan weighs 15 pounds.

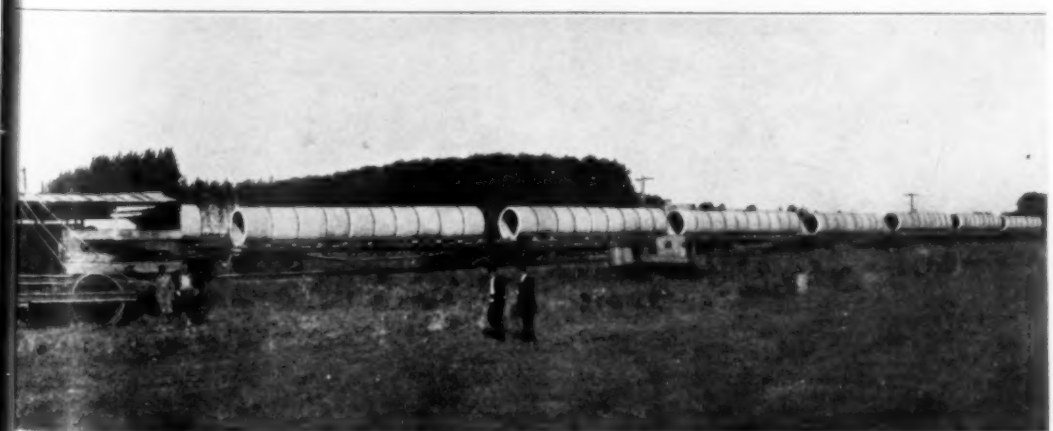
EMERGENCY CLAMP PLUGS HOSE LEAKS

The unexpected failure of a line of fire hose, or the air line on a train, always occasions great inconvenience, and some-



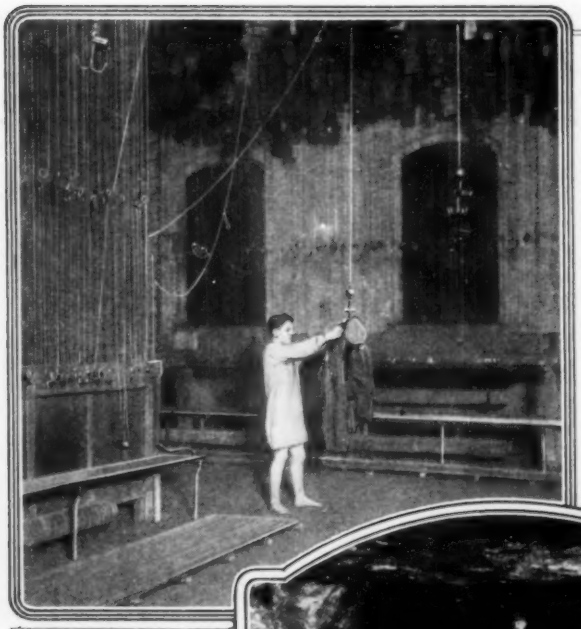
Left: Showing How One-Half of the Clamp is Lined with Sheet Rubber Having Raised Edges. Right: Locked in Position, around a Defective Portion of Hose

times such an accident even has a serious result. A new hose clamp has been devised for making a quick emergency repair of such breaks, which consists of two curved pieces of iron plate hinged to each other. One of these is lined with sheet rubber, the surface of which has raised sections for rendering the seal effective. After fitting the clamp around a defective portion of hose, it is locked in place by means of a double-spring fastening device, which holds it securely in place, until permanent repairs can be made. The device can be applied very quickly.



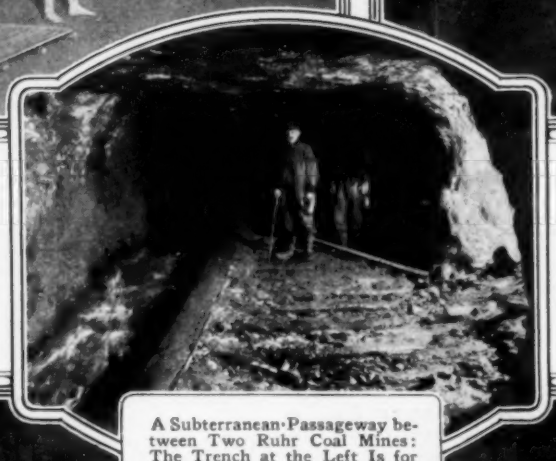
From a Train of Flat Cars, While Trainmen and Spectators Look On. At the Right of the Picture, the Lengths of Tile for a Pony and Cart to be Driven Through. While the Soil in the Picture Looks Productive, It Is the Only Means of Making Its Fertility Available

RECENT VIEWS FROM GERMAN COAL MINES



Change Room in a German Coal Mine Where the Miners Put on Their Working Clothes at the Beginning of Each Shift: Their Street Clothes are Hung on a Hook Attached to a Rope and Hoisted to the Ceiling to Prevent Theft

A Master Miner Establishing the Direction, by Means of a Surveyor's Compass, for a New Working in the Ruhr: In a Well-Organized Mine This Work is Done with Great Care, So as to Develop the Property Economically



A Subterranean Passageway between Two Ruhr Coal Mines: The Trench at the Left Is for Drainage Purposes

Life-Saving Corps at the Gladbeck Mine in Germany, Which is Maintained to Render Assistance to Workers Who have been Exposed to Fire, Gas, or Other Mine Dangers

PHOTOS COPYRIGHT, KADEL & HERBERT

HELD BY FRANCE IN THE RUHR DISTRICT

Above: A Workshop 400 Feet Underground Where Mechanics Repair Electric Locomotives Used for Hauling Trains of Small Cars in the German Coal Mines. Right: Miners at Work with Compressed-Air Machines Drilling Holes in the Coal

The Picture Below Shows Women Workers Removing Loaded Cars from a German Coal Mine in the Ruhr District, Which Supplies 70 per Cent of the Coal Output of Germany. Seizure of the Ruhr Coal Mines Was One of the First Acts of the French in Their Recent Occupation of Germany

PHOTOS COPYRIGHT, KADEL & HERBERT

RAILROAD SIGNAL INSPECTOR HAS SIMPLE TROUBLE FINDER

A signal foreman on the Baltimore division of the Pennsylvania Railroad

This Signal Inspector Saves Himself Much Extra Labor with His Iron Walking Sticks. With the Receiver at His Ear He "Listens In" for Trouble

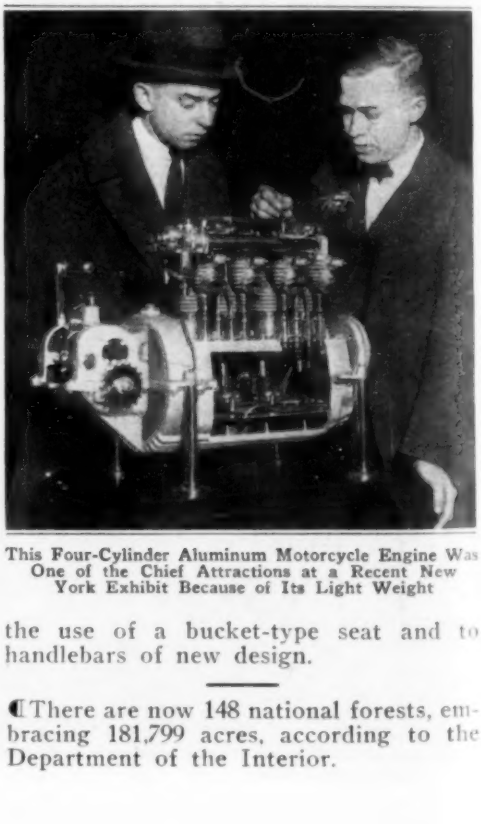
uses a simple and quick method of locating open or grounded wires, which is equally effective for both surface and underground wiring. Two iron walking sticks are used, each connected by wire to a headpiece telephone receiver mounted over the man's cap. Thus equipped, he goes searching for trouble, walking astraddle the signal conduits, and prodding his sticks frequently into the ground, listening intently. When the defective spot is reached, naturally the grounded wire makes the sticks "talk," thereby revealing the fault.

FIND BEETLE CENTURIES OLD SAME AS MODERN SPECIES

Examining a 1,700-year-old tree from the giant forest of Tulare County, California, a scientist has found that two wood-boring beetles, sealed in a hole in the tree over a thousand years, are not appreciably different from beetles of the same species now infesting the forest. It is judged the tree was struck by lightning when about 421 years old, and that it was at that time the tree became infested. Later, the indications are, the tree healed the wound, thus completely sealing in the beetles. Though it is considered remarkable that there has been so little change in so variable a species, one must also recognize, says the scientist making the discovery, that the insect in question pertains to an archaic type, and that undoubtedly the characteristics of the species had been well fixed before the Christian era.

ALL-ALUMINUM CYCLE ENGINE LIGHT AND POWERFUL

The demand of motorcycle fans for a powerful yet lightweight motor has resulted in the development of a four-cylinder aluminum engine. Special attention has been paid to accurate balance, in order to produce ease of steering and more perfect control at high speeds or on bad roads. A three-speed transmission is housed in the rear portion of the motor base, power being transmitted through a large multiple-disk clutch built into the flywheel. The pistons are also made of aluminum and have a bore of $2\frac{3}{4}$ inches by $3\frac{1}{4}$-inch stroke. This machine is said to have unusually secure and comfortable riding qualities, owing to



This Four-Cylinder Aluminum Motorcycle Engine Was One of the Chief Attractions at a Recent New York Exhibit Because of Its Light Weight

the use of a bucket-type seat and to handlebars of new design.

¶ There are now 148 national forests, embracing 181,799 acres, according to the Department of the Interior.

Side View of Steam Automobile Fitted with a Body Similar to a Cabin Cruiser: It Is 20 Feet Long, Weighs 4½ Tons, and Provides Accommodations for Six Persons. The Wireless Equipment Has a 1,000-Mile Range

CLOTH KNIT, NOT WOVEN, BY ENGLISH MACHINE

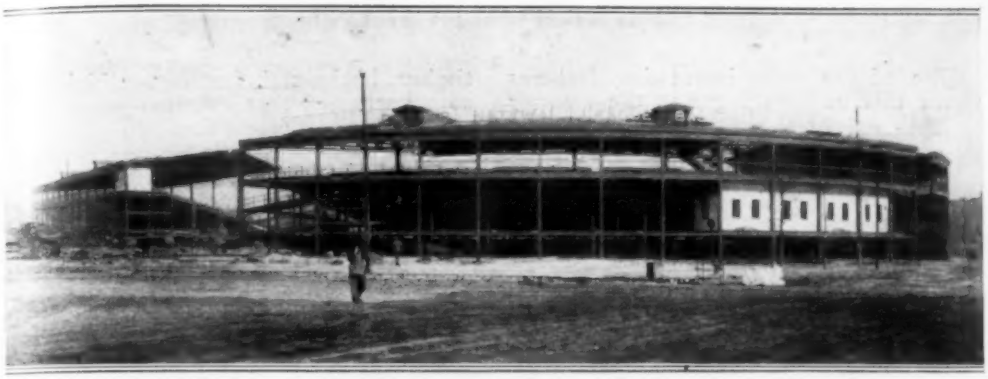
Following the improvement of knitting processes for underwear to the point at which it has practically displaced cloth, comes an English method of knitting cloth for outer garments. For two years, coarser woolen mixtures like heather cloth have stood the test of wear. Now a knitting machine has been manufactured which is claimed to turn out the fine, smooth-finished fabrics, like meltons, at a cost which makes them competitors of woven goods. What is called the "80-feed circular latch-frame needle" will produce a fabric for general clothing purposes at the rate of one yard a minute. Knitting at this rate, one girl is able to tend two machines.

LAND-GOING "YACHT" SEEN ON CALIFORNIA ROADS

A land-going "yacht" has made its appearance in southern California. The queer "craft," built on the chassis of a steam automobile, has the appearance and most of the equipment of a small modern yacht. Twenty feet long and with a "displacement" of four and one-half tons, it accommodates six persons. Within the cabin are a refrigerator, steam tables for cooking, and a washbasin with hot and cold water, while other nautical touches, visible from the outside, include a steam whistle, ship's bell, port and starboard lights, and several strong searchlights. A stack, at the front, carries the exhaust from the engine.

Front View of the Land-Going "Yacht," the Stack of Which Carries the Exhaust from the Engine: A Refrigerator and Steam Tables for Cooking are Included in Its Equipment

Bird's-Eye View of the World's Larges Single-Deck Grandstand, Now Nearing Completion at the Chicago National League Ball Park: The New Stands Have a Seating Capacity of 30,000, Which Is Comparable to That of the Largest Two and Three-Deck Stands, and Possess the Advantage of Giving to Each Spectator an Unobstructed View of the Field and an Opportunity to Watch the Play from a Very Favorable Angle. Part of the Added Box Seats can be Seen at the Left, Bordering on the Playing Field. At the Right and Back, on Either Side of the Scoreboard, Are the New Bleachers, Which Are of Steel Construction



View from the Southwest Side of the Chicago National League Ball Park, Showing the Old Stands after being Moved to Their New Position: The Gap between the Stands at the Left has Since been Filled In with New Stands

WORLD'S LARGEST SINGLE-DECK GRANDSTAND

BY HENRY S. WHITE

AN altogether unprecedented engineering enterprise, that will involve an outlay of $450,000, is now nearing completion at the Chicago National League Ball Park. The old grandstand, with a seating capacity of 15,000, is being transformed into a new stand with a seating capacity of 30,000. Moreover, the playing field has been considerably increased in area, so that one of the foul lines, which was formerly 50 feet short of the regulation, is now moved back the proper distance.

The original stand was entirely of structural steel. It was 120 feet wide and about 765 feet long, with a single sloping deck, and the usual kind of steel-trussed roof. In plan it was composed of a central curved section with a straight section at each end, tangent to the curve. In undertaking the enlargement, the rivets in all the splices of the steel structure along each of the two radial lines where the straight sections joined the curved one, were burned out, thus disjointing the stand into three sections. The section at the east end of the stand was left in place, the curved one was moved back about 100 feet, and the other straight section, at the north end, was moved back until it was in position to increase the length of the new stand to nearly 1,000 feet. This left two gaps between the sections in their new positions, one about 115 feet long, and the other about 150 feet. These two gaps were built in with steel roof trusses and new seating decks to line up with the deck in the old sections.

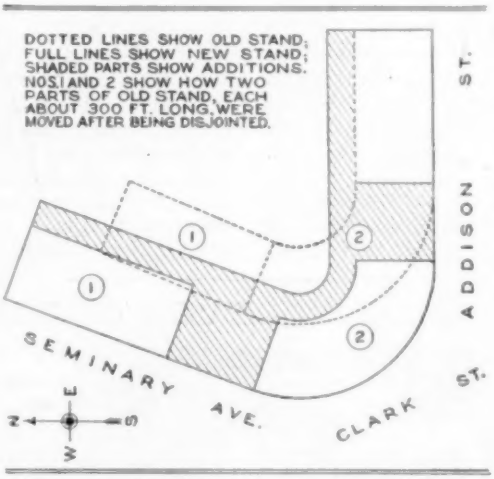

DOTTED LINES SHOW OLD STAND; FULL LINES SHOW NEW STAND; SHADED PARTS SHOW ADDITIONS. NOS. 1 AND 2 SHOW HOW TWO PARTS OF OLD STAND, EACH ABOUT 300 FT. LONG, WERE MOVED AFTER BEING DISJOINTED.
ADDISON ST.
SEMINARY AVE.
CLARK ST.
1
2
1
2
N
W
E
S

Diagram Showing the Relative Size, Shape, and Location of the Old and New Stands at the Chicago National League Ball Park

Before this was done, the ground level of the playing field was lowered about 7 feet, allowing for the erection of new box seats that extend around the whole inside line of the new stand, making its total width 167 feet, nearly 50 feet more than the old stand. This will make it the largest single-deck stand in the world. There are a few two and three-deckers with a greater seating capacity, but they have disadvantages not possessed by the single-decker, where there are no obstructions whatever, so that spectators in all parts of the stand with equal facility can see balls in the air, and watch the players in the field. There are also no stairs necessary. Instead there is a ramp, or walk, slightly inclined and easily accessible.

One of the most interesting features about this undertaking was the manner of moving the two sections of the old stand to their new locations as parts of the new stand. Naturally the more difficult section to move was the curved one. It had 144 columns for which concrete foundation piers had to be prepared in the new location before the moving. In each of these piers were either two or four vertical anchor bolts —altogether about 450—that had to be set so accurately that every one of them would exactly match up with the holes in the 144 column base plates.

Close-Up of the Northwest Section of Stands after Moving, but before the New Box Seats were Added: Back of the Stand, at the Right, a Part of a Ramp Appears

To accomplish this, the section, before being moved, was jacked up and placed with the column bases upon very rigid timber horizontal framing, which was so constructed that continuous cap timbers lined up with nine narrow-gauge railroad tracks previously laid from the old to the new location, where each track straddled each line of foundation piers in such a manner that each column came to rest exactly over its individual pier. Between the bottom of the cap timbers and across each of the rail tracks, were steel rollers to facilitate the moving of the whole structure.

The moving was done by means of two horse-driven capstans, one opposite each end of the structure, with a long continuous steel cable between them, which, in connection with a series of pulleys and blocks—a set for each rail track—hauled the curved section of the old stand back 91 feet in two hours. At each column were an average of about six jacks, making a total of 840. These were operated by 80 men directed by whistle signals from the superintendent. At its new location everything had been done with such remarkable precision that when the structure was slowly lowered, by simultaneously and equally turning all the jacks, the 450 holes in the column bases slid over their respective anchor bolts without a single exception—certainly a remarkable example of perfect accuracy.

POPCORN STAND ON CHASSIS OF SMALL AUTO

Two Views, Front and Rear, of Corn-Popping Outfit, Mounted on an Auto Chassis: The Vender Operates the Outfit in a Wisconsin Town

An enterprising popcorn vender, operating in a small Wisconsin town, has removed the body from his automobile and erected on the frame, at the rear, a modern corn-popping outfit. This unusual arrangement makes it possible for him to tour the city and near-by communities during the summer, when fairs, picnics, circuses, and the like, are in progress. In the winter he parks at a busy street intersection.

The Canvas Above Has behind It a Magnetized Framework, So That the Models, Also Painted, may be Attached on Their Appropriate Places, by Fastening a Tin Strip to Their Backs with Adhesive Tape. To the Left are Shown a Salesman's Traveling Case, Two of the Canvases, and Some of the Models

DISPLAY REMOVABLE OBJECTS ON PAINTED BACKGROUND

Models of monuments and other objects are often displayed without the proper settings. To show reproductions of this kind to better advantage, there has been invented a system in which a natural setting for the article is painted upon a canvas, backed by a framework that is magnetized in certain appropriate places. The models are also paintings and may be attached at the magnetized areas of the background by fastening a tin strip to their backs with adhesive tape. There are no projections or defacing objects to mar the background. While this innovation may be of benefit in stores or other permanent quarters, it is thought it will be of even greater advantage to the traveling salesman who may carry with him one of the backgrounds and various styles of the articles he sells.

OCEAN SHIP HAS CIRCULATING LIBRARY AND BOOKSHOP

Space for a combined circulating library and bookshop has been arranged on the new steamship "Tuscania," which plies across the Atlantic. The library, said to be the only one of its kind, has a large collection of books and has proved popular among the passengers. The bookshop run in connection with the library, carries a representative number of the latest works, and has also met with success.

Passenger Taking Out Book from the Circulating Library of the High-Seas Bookshop on the "Tuscania," a New Atlantic Liner

NEW FORM OF VIOLONCELLO HAS FIVE STRINGS

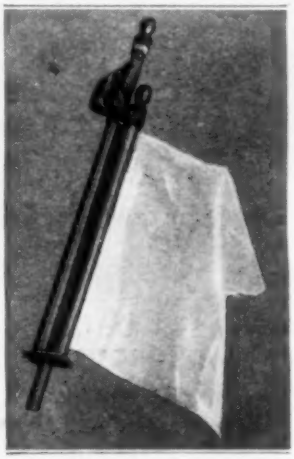
A new form of the cello, having five strings instead of the usual four, has been developed. The additional one is an E-string, made of No. 7 piano wire, which is kept under a tension of 60 pounds by a small worm gear, and extends the tone range of the instrument considerably. The cello has a leather strap attached to it, which passes around the body of the player, while his left foot rests on a small stool with a toe strap.

HAND-OPERATED MONORAIL CAR EXCELS WHEELBARROW

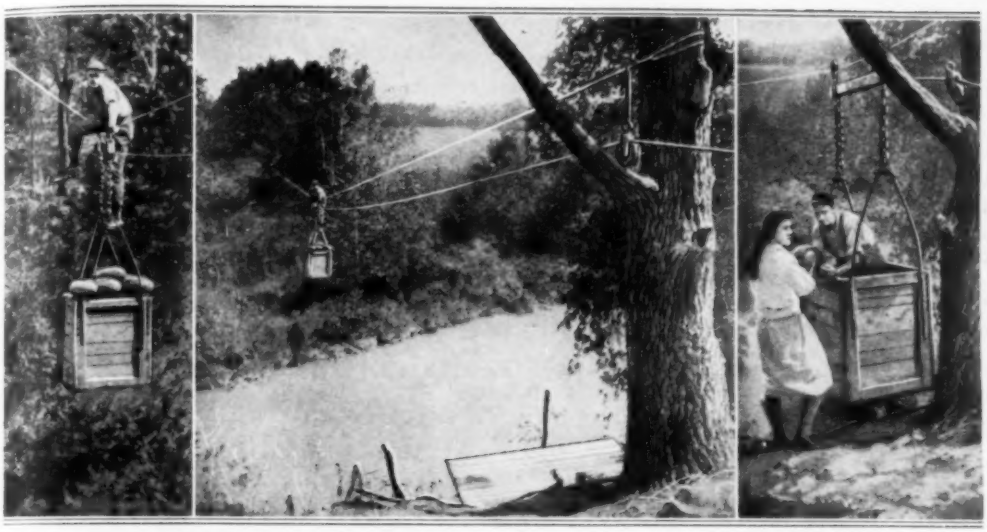
To reduce the amount of energy required to push or haul a wheelbarrow or small-wheeled truck, a German engineer has designed a monorail hand car, which, he claims, lessens this energy by three-fourths. The new car consists of a frame in which two flanged wheels are mounted, one behind the other, for riding on a single rail. Upon this frame a dumping body is mounted, and a long rod is attached to the frame for pushing the car along. This rod gives the operator sufficient leverage to control the car with ease. The body is easily tipped by tilting it on its frame when it is necessary to discharge a load.

LOCOMOTIVE FLAG HOLDERS ARE ALSO CONTAINERS

A new holder for the signal flags carried by locomotives has been designed to serve also as a container, to prevent unnecessary soiling or misplacing of the flags. The device resembles a double-barreled auto-tire pump, with an extension at the base which fits into the present flag socket on the locomotive. The flags, green and white, are drawn from a slot made along the entire length of each cylinder, while springs inside prevent them from dropping out. After use, the flags are rolled back by turning the knob at the upper end of each flagstaff.



A Monorail Hand Car Which is Supplanting the Wheelbarrow in Germany: At the Left, It is Used on a Temporary Portable Single-Rail Track, and at the Right, on the Right of Way of a Railroad



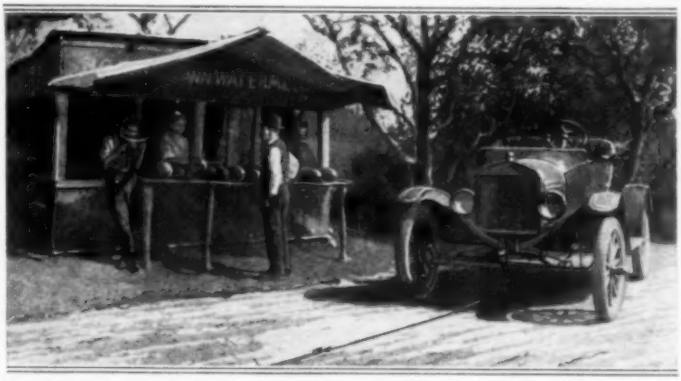
Saving Time and Distance Carrying Melons over a Creek on a Cable: Left, Starting with the Load; Middle, Crossing the Creek 100 Feet above the Water; Right, Unloading Melons on Farther Side of the Creek on Receiving Platform

ELECTRIC BOILER CAR HEATS SWISS RAILWAY COACHES

A railway car carrying an electrically heated boiler for generating steam to heat passenger coaches, was recently put in service on the Swiss federal railways. This unusual equipment was introduced because, on through trains, there are a certain number of coaches from foreign lines arranged for steam heat, although, as on most electric lines, the Swiss coaches are provided with resistance heaters. The boiler, which is rated at about 1,000 horsepower and intended for about 120 pounds' steam pressure, is supplied with 15,000-volt alternating current, which passes from the overhead line through the trolley, and through choke coils and special switches, to two electrodes inside the boiler. A built-in pump circulates water against the electrodes.

AERIAL CABLE CARRIES MELONS OVER CREEK

In an Ohio melon-growing neighborhood quick time was made and a two-mile detour avoided in getting melons across White Oak Creek by the use of a wire cable and a small automobile. On the farther side of the creek, one end of a 238-foot cable was attached to a tree, 100 feet above the creek, while the other end of the cable terminated at a shanty in the melon field. Then great boxes of melons were hung to a pulley running on the cable. A rope running through another pulley lashed to the tree had one end fastened to the box of melons and the other tied to a small roadster car on the far bank of the creek. It was an easy matter for the car to pull the box of melons, as it swung 100 feet above the stream, to an unloading platform at the foot of the tree. Much time was saved in a busy season by the simple plan of the cable and the car and the use of a little ingenuity.



The Car That Pulled the Melons over the Creek with a Long Rope, and Booth on a Public Road Where They were Delivered and Sold

INDIAN-RICE HARVESTING NEW INDUSTRY

BY LAWRENCE WM. PEDROSE

AN industry of growing importance to the Northwest, in that it garners a food resource heretofore used only in a desultory manner, is the harvesting of Indian, or Canada, rice, a wild grain which grows in great abundance in the lake region of northern Minnesota and sister states, and in the northwest territories of Canada.

Wild rice has both food and medicinal value, possessing high caloric content and being easily digested. It is often prescribed by physicians for dyspepsia and other intestinal disorders. Because of its delicate flavor, it is also prized as a companion dish for game, and is in demand for this purpose both in this country and abroad.

As far back as history records, wild rice was harvested by the Indians and the grain used for gruel. It is a product of lakes and swamps in the prairie regions and not adapted to any form of cultivation, but in the Northwest tens of thousands of acres of wild rice are to be found, and these constitute the principal feeding and breeding grounds of ducks, geese, and other migratory waterfowl during their summer stay in the North.

The largest wild-rice fields are found around the edges of prairie lakes in water 2 to 4 feet deep. In the spring the rice shoots commence to grow from the lake bottom, and by the beginning of summer appear above the surface of the water. In August, the stems head out and quickly ripen, dropping the grain, which sinks into the muck of the lake bottom, protected from the cold of winter. Soon after the ripening period, the rice grass disintegrates and also sinks to the bottom to rot and form new soil for the growth of the next crop.

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Harvesting Indian Rice Is Something Machinery cannot Do. Left: Using, Alternately, the Right Hand and Left, the Harvester Bends the Rice Stems over the Boat's Gunwale and Knocks Off the Heads with a Sharp Blow of the Stick. Right: A Typical Chippewa Squaw with Her Basket of Grain

The delicate nature of wild rice has made it difficult to improve the Indian method of harvesting. The grain falls from the ripening heads before it becomes dry, otherwise it would float upon the water, and thus harvesting is a task requiring skill. The best method has been found to be the use of a canoe, or other light boat of shallow draft. The boat is poled through the rice patch. A squaw sits in the stern with a round stick, 1 inch in diameter and about 2 feet long, in either hand. With her right hand she sweeps a quantity of grass in over the gunwale of the boat and knocks off the heads of grain with a sharp blow from the stick in her left hand. Then with the left hand she sweeps in a quantity of grass, from the other side of the canoe, and knocks off the headed grain with her right hand.

This View Shows How the Indians Thresh the Grain by Prodding It with Clubs Which Bruise the Husks and Thereby Release the Grain from the Chaff. It is Claimed This Is the Only Task Which could be Improved by Mechanical Means

From 10 to 15 bushels of headed grain can be gathered in a day by each boat. The heads are heavy, weighing about 40 pounds to the bushel, and the gathered product runs about 80 per cent grain and 20 per cent stems and chaff. The grain is about as thick as a knitting needle and varies from ½ inch to 1¼

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A Rice-Harvesting Camp of the Chippewa Indians: This Is a "One-Squaw" Tepee Made of Birch Bark, and Is Portable, as It can be Quickly Rolled Up and Easily Carried About by One Person. In the Background Are a Few Chippewas, Pioneer Experts in the Harvesting of the Wild Grain

inches in length. The heads are placed in a hand mill for separating the grain from the chaff, the Indians using small cone-shaped "mortars" of wood, into which the heads are dumped and pounded with large pestles. In a receptacle holding a bushel of grain, five or six persons usually operate the threshing clubs.

Lately, the harvesting of wild rice has been undertaken in a commercial way, and machinery is being developed to replace the crude Indian method of threshing, but no successful mechanical device has been found for harvesting the headed grain. In northern Minnesota several large wild-rice plantations have been leased and are being developed. The possibilities of the industry may be seen from the fact that, at present, the retail price of wild rice averages about $1 a pound, with the demand far exceeding the supply. A large part of this demand is from sportsmen's associations and owners of wild-waterfowl preserves, who sow the rice for game food.

Recent improvements in handling and shipping wild rice have increased its scope for propagation purposes. Formerly the only known method of keeping the grain fertile was by submerging it in cold water. Now a container has come into use which provides an insulation of damp moss that keeps the grain in excellent condition, and the product is shipped successfully in 1, 5, and 10-pound packages.

NEW TYPE OF SAFETY SIGNAL FOR RAILROAD CROSSINGS

A new type of railroad signal has been installed, and is now under test, at a level crossing on a street in Chicago, Ill. On an iron post, bearing the word "Railroad" very conspicuously, are four lights that display the word "Stop" in letters when a train is approaching. The stop signal appears only at the approach of a train.

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Railroad Safety Signal for Level Crossings: Whenever a Train is Approaching, the Four Lights under the Sign "Railroad" Display the Word "Stop" in Bright-Red 10-Inch Letters

NEW METHOD EASILY CORRECTS ELECTROTYPE PLATES

Corrections and alterations on electrotype plates have always been tedious tasks because of their permanence, which from other considerations is a virtue. A new method devised by the Bureau of Standards makes this comparatively easy and rapid. An electrode inserted in the nozzle of a hose, through which a solution of copper sulphate is forced against the area on the plate where the correction is to be made, forms the negative terminal of an electric circuit of which the plate is the positive electrode. This rapidly removes the copper to the desired depth. The remainder of the plate is kept from being affected by a coating of ink or other nonconducting material. Current at 12 to 15 volts has been found most satisfactory. The depression, which is as deep as the engraved lines, is leveled from the other side with a hammer and anvil, and, after polishing, is ready for the new work.

¶A "steam screen" declared to be the newest effect in motion photography is seen in a late production. The scene is a stage setting. The curtains are drawn apart, showing a wall of steam coming from the floor back of the footlights and cutting off the view of the stage. Slowly the screen of steam is dissipated, revealing the dancers behind.

NEW APPARATUS DETERMINES SIZES OF CEMENT PARTICLES

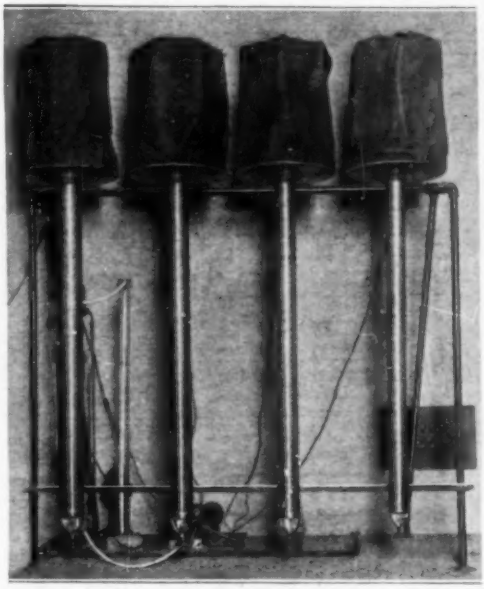
Nearly every large industry now has its research laboratory. As most people know, Portland cement has to undergo many exacting tests in order to prove beyond a doubt that the product conforms to the quality requirements of standard specifications.

Blowing cement up a short brass stack to measure the size of almost infinitesimal particles is one of these tests. Standard Portland cement must be so uniform that 78 per cent will pass a sieve with 40,000 openings to the square inch. But the industry wanted to know just how fine that 78 per cent was. To the average person the task of measuring so nearly impalpable dust particles would seem impossible. An apparatus known as the air analyzer, used at the Structural Materials Research Laboratory, Lewis Institute, Chicago, separates and gives accurate average measurements for particles of cement so fine that it would take 80,000,000 of them, placed in closely fitted rows, to cover a glass plate 1 inch square. In other words, if it were possible to weave a sieve with 9,000 wires each way in a square inch, some cement would pass through.

The air analyzer consists of four brass stacks, each 61 inches high, equipped with a small bowl that fits tightly at the bottom. An air inlet enters the stack a few inches above the bowl, and at the top of each stack a cloth dust collector is attached.

The measuring and separation are done by placing a sample of cement in the bowl and letting air through the inlet nozzle at a specific pressure for a given time. The separation size, which is the measuring unit, depends upon the velocity of the air through the stack. This in turn depends on the size of the air nozzle and the diameter of the stack up which it is blown. In each of the four units the stacks are of different diameters, and the openings in the inlet nozzles are of different sizes. These are so arranged as to give air velocities which separate particles ranging from .00181 inch for the swiftest air flow in the smallest stack, to .00035 inch for the lowest velocity in the largest stack.

Many days were spent in establishing these separation sizes by means of microscopic measurements when the laboratory staff first completed the analyzer. With it, they have proved beyond all doubt that the manufacture of cement requires finer grinding than any other industrial process used on such a large scale. Fine

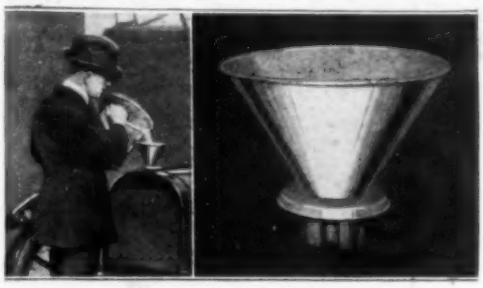


With This Apparatus for Analyzing the Fineness to Which Cement is Ground, Particles as Small as .00035 of an Inch can be Separated

grinding requires power, which accounts for much of the expense involved in the manufacture of Portland cement.

RADIATOR FUNNEL REQUIRES NO HOLDING

Automobile owners will greet with satisfaction the appearance of a new type of radiator funnel, which, after insertion in the inlet cap, will stand erect without holding. In this position it is sufficiently rigid to permit a pail of water to be rested on its edge, thus not only leaving both the filler's hands free to empty the pail, but also relieving him of most of the weight of the pail. The funnel also contains a brass strainer.



A New Funnel for Automobile Radiators: After Insertion, the Funnel Stands without Holding, and the Radiator may be Quickly and Easily Filled

MECHANICAL DEVICE AIDS TOUCH TYPEWRITING

A recently invented attachment for typewriter keyboards, is for the assistance

The Keyboard of This Typewriter is Fitted with an Attachment to Assist the Beginner in Learning the Touch System

of the beginner at touch typewriting. It consists of a frame with inclined bars, extending from the top to the lowest bank of keys, between the rows. The bars project a slight distance above the keys, thus serving as a guide to keep the fingers in the right positions.

COLLAPSIBLE ORCHARD LADDER MAKES FRUIT PICKING EASY

A collapsible orchard ladder, made in two sections, has been placed on the market recently, which greatly facilitates fruit-picking operations and the work of tree pruners. The upper section of the two-part ladder is disposed at an obtuse angle to the lower one, and terminates in a single rail. As this rail is sheathed, no damage to the bark is possible when it is adjusted between the limbs of a fruit tree, and the fruit picker can pick over a considerable range without having to descend and shift the ladder to a new position. This improved ladder can also be quickly adjusted for use as an ordinary ladder, if desired.

The New Orchard Ladder is Easily Carried, and Fruit Picking over a Wide Range Is Possible without Frequent Descents to Shift It to a New Position

BELLS CAST FROM STEEL INSTEAD OF BRONZE

Bells cast from steel are being made to replace those that were melted in Germany during the war, in order to obtain the copper, tin, zinc, and other metals which they contained. Open-hearth steel is specially treated to produce bells that closely resemble in tone and resonance those made of bell-metal alloy. The manufacture requires care in molding, the metal being poured into a mold set with the mouth of the bell uppermost. The casting is cooled slowly, accurately tuned, and given a rust-proof coating.

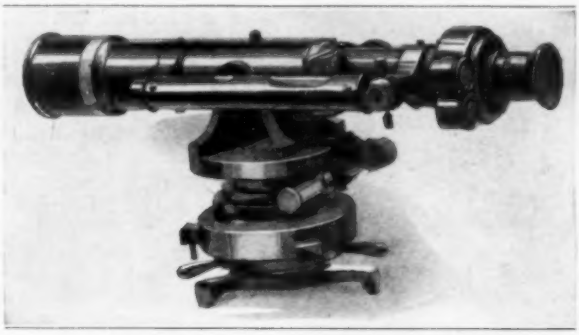
UNIVERSAL JOINT ELIMINATES PINS AND SCREWS

A ball-bearing universal joint of extremely simple construction has been placed on the market recently, which dispenses with small pins as working connections. Each of the two working shafts of the joint has two forked projections at the contact end, which fit into, and are contained by, a two-part spherical housing which is recessed to receive these projecting lugs. The contact faces of the housing also serve as bearing surfaces for each shaft, receiving the thrust and thereby reducing the wear.

¶Experiments made with different types of miners' lamps show that the amount of coal miners are able to move is much greater with a better light. With lamps giving six times the usual illumination, the amount of coal taken out was increased 14 per cent with 21 per cent less dirt, although the improved lamps weigh five times as much as the ordinary type.

LEVELING INSTRUMENT OF SIMPLIFIED DESIGN

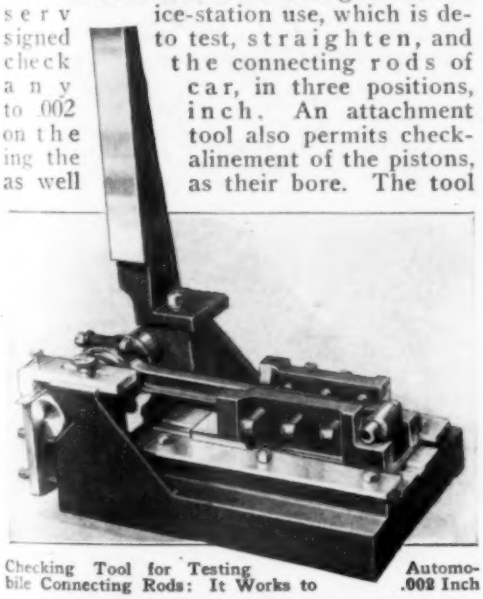
Some interesting departures from the usual construction of engineers' levels have been embodied in a new instrument which has just appeared on the English market. Of special interest is the fact that the telescope is not rigidly mounted to the vertical center of the instrument, as is common practice, but is free to revolve a half-turn within the two collars in which it is mounted. This feature provides an instant means of checking the line of collimation, or the true axis of the telescope, without the more laborious method necessary with the rigid type. Equally advantageous is the placing of the spirit tube to one side of the telescope, instead of under it, and the use of a reflecting prism to facilitate reading the level. The surveyor is thus able to observe the bubble from the eyepiece.



A New Surveyor's Level of Simplified Construction: Instead of Centering between Hair Lines on the Level Tube, One End of the Bubble is Brought Up to a Pointed Indicator. The Bubble is Visible from the Eyepiece

ALINEMENT-CHECKING TOOL OF HIGH PRECISION

The accuracy of automobile parts is an important factor in the construction of a car, and is carefully controlled at the plant, but when repairs are made at a garage, careless checking methods are too often used. An improved instrument and tool has been brought out for service-station use, which is designed to test, straighten, and check any connecting rods of car, in three positions, to .002 inch. An attachment on the tool also permits checking the alinement of the pistons, as well as their bore. The tool is designed to permit convenient adjustment of its parts for making the tests.



Checking Tool for Testing Automobile Connecting Rods: It Works to .002 Inch

OIL SIGNAL FLASHES WARNING AUTOMATICALLY

An automatic oil signal for automobiles has been placed on the market recently which flashes a warning to the driver whenever the oil in the crankcase is low or the lubrication is faulty. The signal consists of a cast aluminum base, fastened to the dash, and having a very thin brass diaphragm at the top. Electrical contact points are arranged beneath the cover in such a way that a circuit is established whenever the oil pressure becomes too low, lighting a small ruby lamp as the danger point is near. The device is dependent for operation on connection with the oil pump of the car, but not applicable to cars which are lubricated by the splash system.

An Automatic Oil Signal for Automobiles: After Fitting to the Dash, a Connecting Wire is Run to the Lamp and Then to the Switch Ignition Terminal

MOLDS FOR DECORATIVE SEALING-WAX FORMS

Molds of various forms, which enable the home decorator to make book ends, toys, and other articles from sealing wax,

Decorative Forms Made from Sealing Wax: Above, Book Ends of Wax; Below, Molds for Making Animal Forms

are a novelty on the market. The molds are inexpensive. A lead base gives stability. Should the worker become tired of any object he has made, the wax may be melted and made into some other article. The process offers possibilities for developing artistic talent and an eye for color.

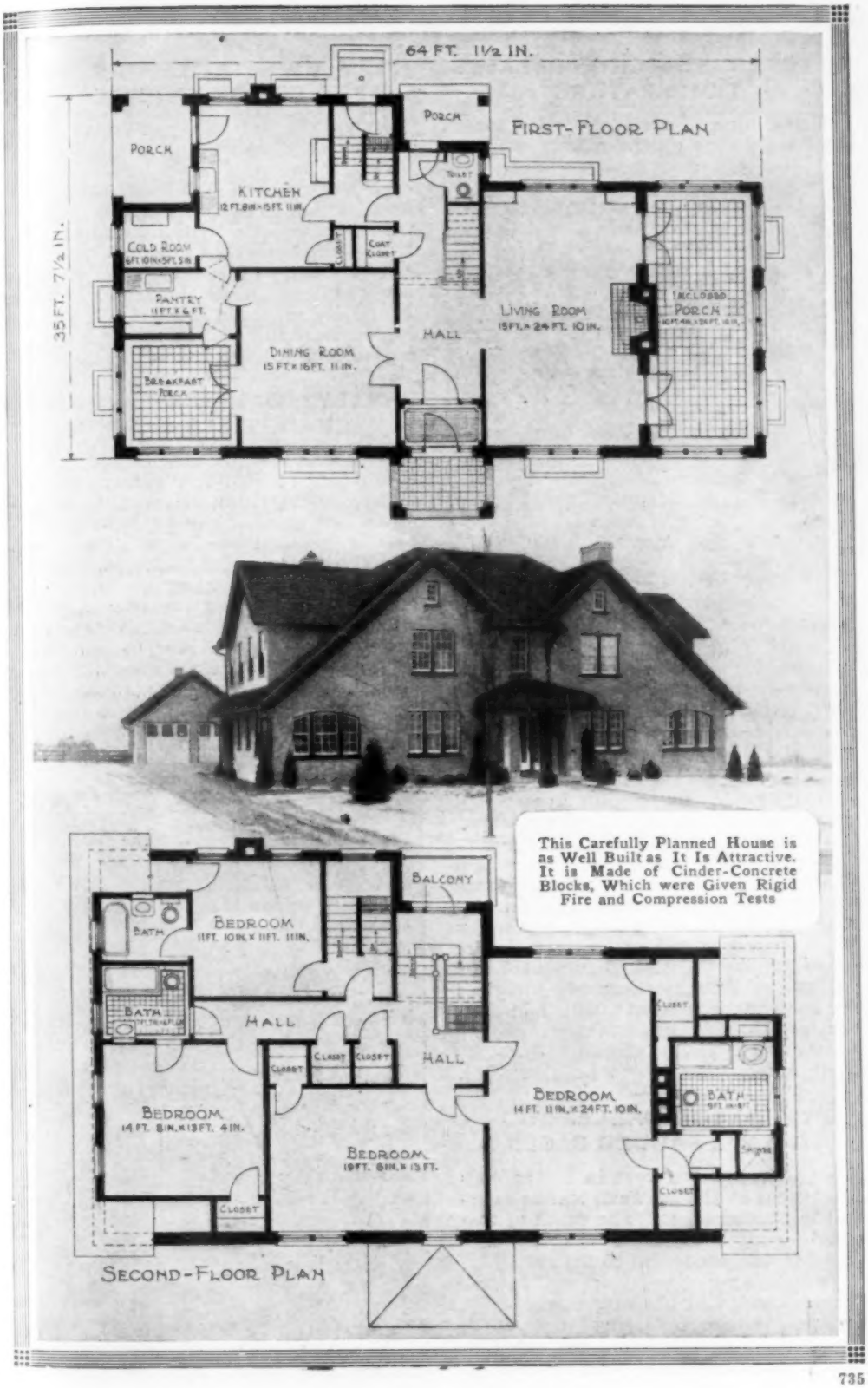
CAR FERRY DRIVES BLINDLY BEFORE GALE INTO PORT

By a wild freak of chance, when Ann Arbor car ferry "No. 4" was battling an 80-mile hurricane on Lake Michigan with the mercury near 20° below zero, the storm drove it through the narrow space between the breakwaters and into Little Betsey Bay at Frankfort, Mich., its home port. With 19 loaded cars loose on the lower deck and battering the sides, Captain Fredericksen had lost his bearings at night. His wireless operator sent out the "S. O. S." call, and near morning the reply came that the ferry must be close to shore. Half an hour later the crew felt a crash. They rushed on deck. "No. 4" was safe at home. In the blinding snow, by some miracle, it had driven through the 200-foot channel into Little Betsey Bay, and it lay to with ice 30 feet high round its masts. The Ann Arbor Railroad car ferries carry loaded freight cars winter and summer between Frankfort, Escanaba, Menominee, and Manistique, Mich.

OWNER MAKES NOVEL FIRE TEST FOR NEW HOUSE

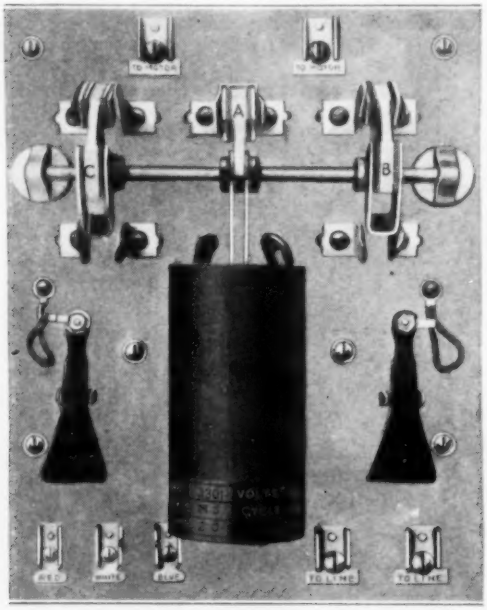
When an eastern architect received a commission recently to prepare plans for a new residence, he had no inkling that the owner would subject the building material used to the extraordinarily severe tests described below. The wall material selected — cinder-concrete blocks—was to be coated with stucco, and was expected to be fully fireresistant. Accordingly, the owner proceeded to build a small testhouse with blocks of this material, which he weighted down with 11 tons of pig iron. This done, he had the house filled with cord wood, poured some kerosene on it, and then applied a match. The fire raged for a whole hour, the maximum temperature reached being 2,200° F., but the blocks remained undamaged. Not yet content, the owner then took one of the blocks down to the plant of which he is superintendent, and had it subjected to a pressure of 1,200 pounds to the square inch in a large hydraulic press.

Test Block House, Loaded with 11 Tons of Pig Iron, in Which the Fire Raged for an Hour: The Blocks Withstood This as Well as More Severe Compression Tests Later


64 FT. 1½ IN.
35 FT. 7½ IN.
FIRST-FLOOR PLAN
PORCH
PORCH
KITCHEN
12 FT. 8 IN. × 15 FT. 11 IN.
TOILET
CLOSET
COAT CLOSET
COLD ROOM
6 FT. 10 IN. × 5 FT. 5 IN.
PANTRY
11 FT. 8 IN. × 6 FT.
DINING ROOM
15 FT. × 16 FT. 11 IN.
HALL
LIVING ROOM
15 FT. × 24 FT. 10 IN.
ENCLOSED PORCH
BREAKFAST PORCH
This Carefully Planned House is as Well Built as It Is Attractive. It is Made of Cinder-Concrete Blocks, Which were Given Rigid Fire and Compression Tests
BALCONY
BEDROOM
11 FT. 10 IN. × 11 FT. 11 IN.
BATH
BATH
HALL
CLOSET
CLOSET
CLOSET
HALL
BEDROOM
14 FT. 8 IN. × 13 FT. 4 IN.
BEDROOM
19 FT. 8 IN. × 13 FT.
CLOSET
BEDROOM
14 FT. 11 IN. × 24 FT. 10 IN.
CLOSET
BATH
CLOSET
SECOND-FLOOR PLAN

ELECTRIC SWITCH REGULATES TEMPERATURE

A new type of automatic relay switch has been placed on the market which is



A Heat-Governed Electric Switch: A Is the Main-Line Switch to Apparatus to be Controlled; B Is the Selector Switch, and C Controls the Two Contactors on Either Side of the Containing Cylinder

designed to provide convenient means for temperature control on automatic oil burners, electric refrigerating apparatus, electric heating units, or similar equipment where it is necessary to operate a switch in accordance with temperature changes. The unit is in reality a double-control switch of low voltage, power for which is provided from a transformer built into the relay. The control for temperature changes selectively energizes two low-voltage magnets, which in turn energize 110-volt solenoids, closing or opening the main-line circuit to the motor or other apparatus to be controlled.

PYTHONS IN DALLAS ZOO TO HAVE PADDED CAGES

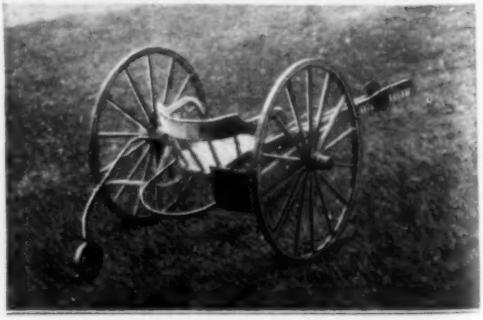
Hereafter pythons kept in the zoölogical gardens at Dallas, Tex., will be quartered in padded cages. The death of two mammoth pythons, each over 22 feet long, was due, according to their keepers, to cankerous sores on their mouths and tongues, caused by striking the sides of the cages when devouring their food. They will be mounted and preserved in the Texas Museum of Natural History.

FIRM GIVES KITCHEN LABELS FOR USE ON EMPTY CANS

In order that the consumers of its product may use emptied cans more conveniently as containers for beans, starch, corks, twine, and other kitchen miscellanea, a San Francisco coffee firm is distributing booklets containing 24 gummed labels which may be used to index the cans for the pantry shelves. The labels are red with white lettering, and are 2¼ by 3⅜ inches in dimensions. This affords a neat and convenient way of keeping various kitchen commodities.

PARALYZED MAN IN WHEELED CHAIR TILLS GARDEN

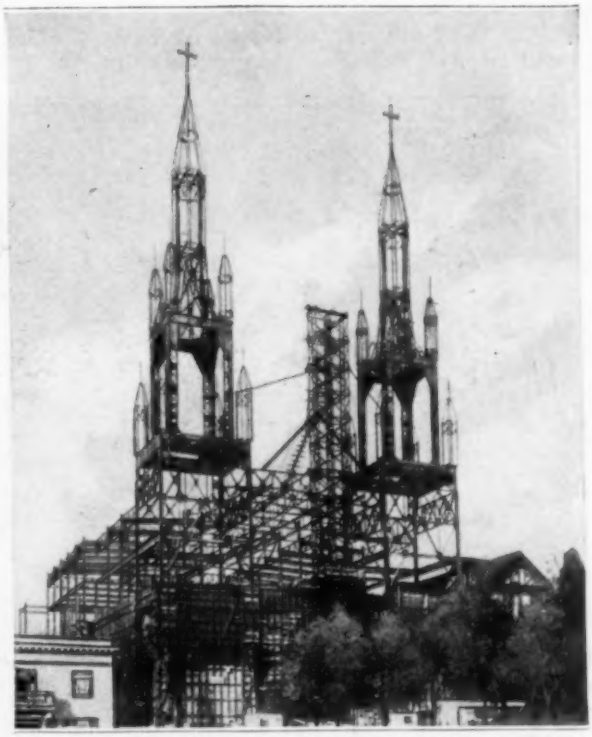
With his combined wheel chair and cultivator and his half-acre garden, William Hartig, of Excelsior, Minn., gives a demonstration of what can be done in overcoming physical handicaps. Hartig has had three strokes of paralysis, has lost the use of his left side, has the use of only two fingers and one thumb, and is unable to stand or walk. Yet, with a chair mounted on a pair of old buggy wheels, he works his garden. Pushing backward with his right foot in his wheeled chair, he cultivates with hoe and rake as far as he can reach, then pushes farther backward for a new start.



Above: Paralyzed Man Working in His Garden with Chair Cultivator. Below: Side View of Cultivator

STEEL SKELETON OF CHURCH IS UNUSUAL SIGHT

With its steel skeleton towering skyward and its walls hardly half finished, a church under construction in San Francisco stands as an evidence of a new idea in church architecture. Even to the finials on the steeple tops, the steel structure is complete. Contrasted with the usual method of building a church stone by stone from the foundation up, the skeleton of steel with its interlocking beams and columns and its slowly rising walls is sufficient to attract attention.



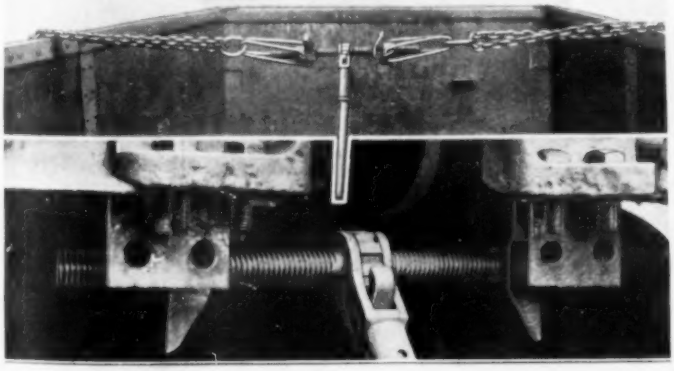
Frame of Church in Construction, Showing Steel Skeleton Far in Advance of Concrete Walls: The Beauty of the Completed Structure is Suggested Even in This Unfinished State

NEW FLUX PERMITS ZINC WELDING

A flux has recently been developed in Germany, that is said to enable the successful welding of zinc. The oxide that forms on the surface of molten zinc is dissolved by an alkaline flux which liberates hydrogen. Not only is continuous welding of zinc possible, but other metals, such as copper and brass, can be joined to zinc with the aid of this flux, which can be applied like solder or made into a solution to form a bath.

TEN-TON JACK HAS PUSH-AND-PULL FEATURES

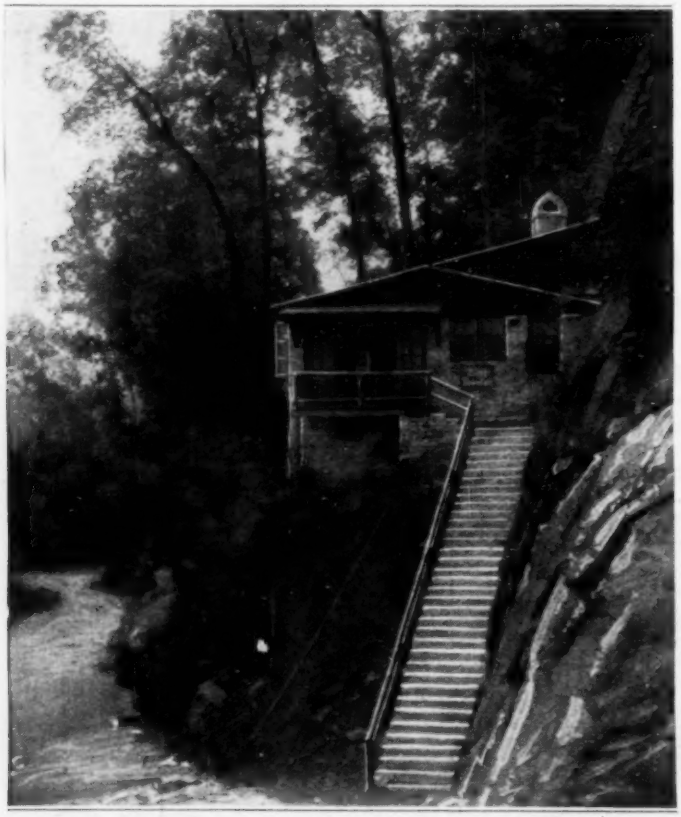
An interesting push-and-pull jack has been developed recently, which is intended primarily for straightening center sills on the draft-gear end of railroad cars—the sides of steel gondola cars frequently becoming distorted with heavy usage—either by pushing apart or pulling them together where bent. The design of the new jack is extremely simple, consisting of a steel screw, ratchet with pawl, and two cast-steel nuts. The latter are provided with flat projections on one side for pushing, and hooks on the opposite side for pulling. Chains and additional hooks may also be attached for pulling in the sides of freight cars which have been bent outward. The jack is made in various capacities up to 10 tons.



A 10-Ton-Capacity Push-and-Pull Jack, Combining Ruggedness and Simplicity of Construction, for Straightening Center Sills on the Draft-Gear End of Railroad Cars: Flat Lugs are Provided for Pushing, Hooks for Pulling, and Extra Hooks on the Sides for Pulling with Chains

FIVE MILES OF GRANITE IS BACK WALL OF HOUSE

With the back wall of his house composed of five miles of granite and the other three of substantial masonry, the owner of a certain home in the Blue Ridge Mountains of western North Carolina is comfortably free from worries about the stability of his dwelling. It is known popularly as "the house with a wall five miles thick." Its occupants call themselves the "cliff dwellers."



Built against the Side of a Mountain, This House in the Blue Ridge Range of North Carolina Has Five Miles of Granite for One of Its Walls

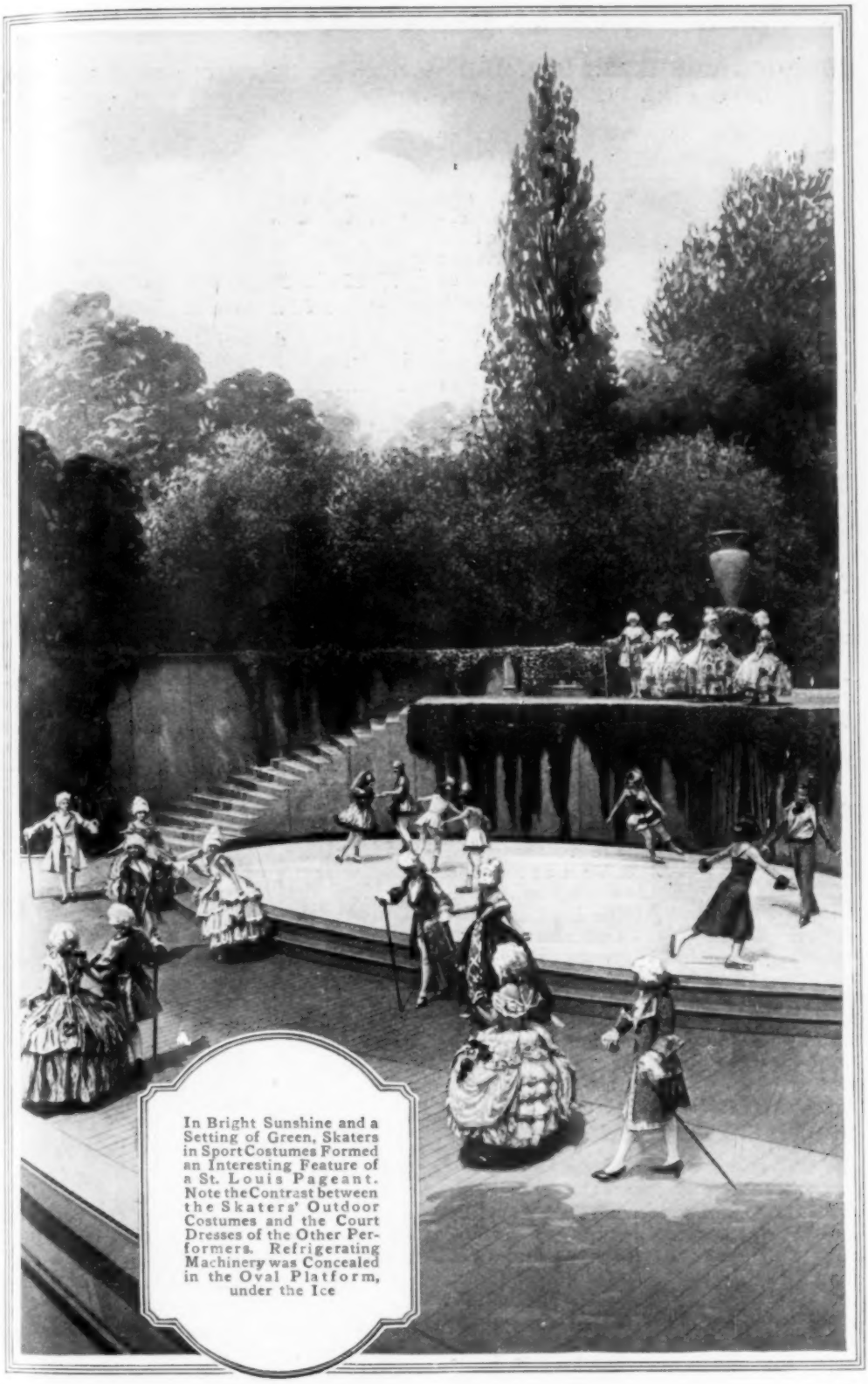
CONCRETE PIPE CAST BY NEW CENTRIFUGAL PROCESS

Concrete pipe, centrifugally cast, is now being made at several places in the United States, according to a system which has some original features as compared with the methods developed in Germany and later used in modified form in other countries. The first step in the process is building up a wire cage, to the ends of which are tied the metal end joints of the pipe. This is placed in a horizontal cylindrical form which is then partly filled with concrete mortar. The form is revolved rapidly on its horizontal axis, which action throws the concrete against the inside of the form, making what is the wall of the pipe when the concrete sets. The finished units are said to present a smooth uniform surface, and when placed end to end are remarkably true to line and circumference. By means of a special joint the pipe can be made tight for comparatively high pressure, a 20-inch pipe line being in service under a pressure of 50 pounds to the square inch. This pipe has walls 2½ inches thick.

¶ Rabbits breed so fast in the Hawaiian island of Laysan and destroy the vegetation to such an extent that the government will exterminate them in order to protect the birds.

ICE SKATING IS FEATURED IN WARM WEATHER

Outdoor ice skating was the novel attraction at a pageant held in Forest Park, St. Louis. In spite of the maximum St. Louis temperature, ice was produced artificially and a surface maintained that permitted skating. The skating rink was 26 by 48 feet in size. First, a foundation consisting of a false floor was built, on which cork board was laid to prevent heat leakage. Over this came a sheet of waterproof canvas, and on the canvas were supports for the refrigerating coils. Frozen sand made a base for the water which was sprayed upon it, and frozen in 10 hours by the direct-expansion system. So successfully did the freezing process operate, that the skaters commented on the perfect surface of the ice.



In Bright Sunshine and a Setting of Green, Skaters in Sport Costumes Formed an Interesting Feature of a St. Louis Pageant. Note the Contrast between the Skaters' Outdoor Costumes and the Court Dresses of the Other Performers. Refrigerating Machinery was Concealed in the Oval Platform, under the Ice

DEVICE CONVERTS HAMMER INTO PIPE WRENCH

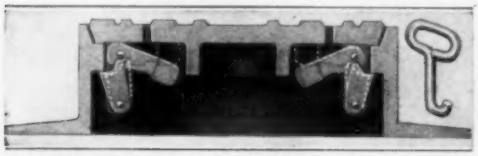
A new and interesting device is a simple attachment that in a few seconds makes a pipe wrench out of an ordinary claw hammer. It consists of two hardened steel jaws that swing on a ring which slips over the claw of the hammer. The action is such that the harder the pull on the hammer handle, the tighter the jaws grip the pipe. It is an inexpensive and convenient device for home use.

HEADLIGHT DIMMER OPERATED BY PUSH BUTTON

An automobile headlight-dimming device, recently placed on the market, is in the form of a push-button control fastened to the footboard of the car. Two wires connect to the headlight circuit and a slight pressure of the foot sends the current through the self-contained resistance in the device, instantly dimming the lights. The lights become bright when the foot pressure is removed.

SELF-LOCKING MANHOLE COVER PREVENTS COMMON ACCIDENT

The frequent accidents caused by the tilting of manhole covers in streets are not likely to occur when a new automatic locking device is used. The cover locks automatically when placed in the frame. To unlock it, two keys are inserted through slots in the cover and given a quarter turn, when levers are engaged which release the latches. The mechanism will not unlock without the keys.



Manhole Cover Which Locks Automatically: At the Right Is One of the Keys Required to Unlock It

SIMPLE BENDER FORMS IRON INTO MANY SHAPES

A handy device for bending bar iron, in various sizes of rounds, flats, and squares, has recently been put on the market for the benefit of blacksmiths, repairmen, and farmers. It consists of two forked pieces of steel, each having a number of different-sized holes, hinged together. One end can be fastened to a post or bench, or held in a vise.

POCKET-SIZE TYPEWRITER IS SMALLEST IN THE WORLD

The making of miniature models of comparatively large mechanical appliances seems to have a peculiar attraction for inventors, who often display considerable ingenuity in giving free rein to their hobby. An interesting example of this kind is the recent construction of a miniature typewriter, pocket-size, and claimed to be the smallest of its kind in the world. The machine takes a full-sized letterhead sheet, yet is so small that it can easily be held in the palm of one hand while typing with the other.

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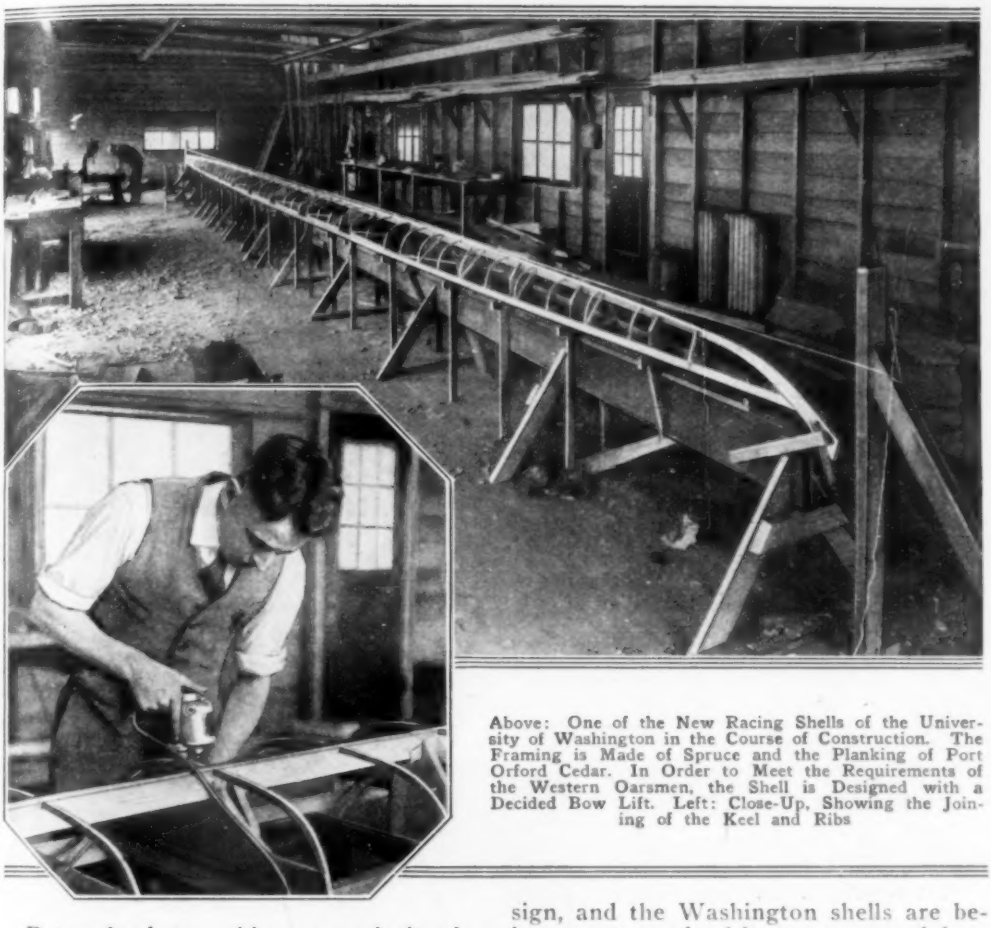
¶ When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

WESTERN UNIVERSITY BUILDS NEW RACING SHELLS



Above: One of the New Racing Shells of the University of Washington in the Course of Construction. The Framing is Made of Spruce and the Planking of Port Orford Cedar. In Order to Meet the Requirements of the Western Oarsmen, the Shell is Designed with a Decided Bow Lift. Left: Close-Up, Showing the Joining of the Keel and Ribs

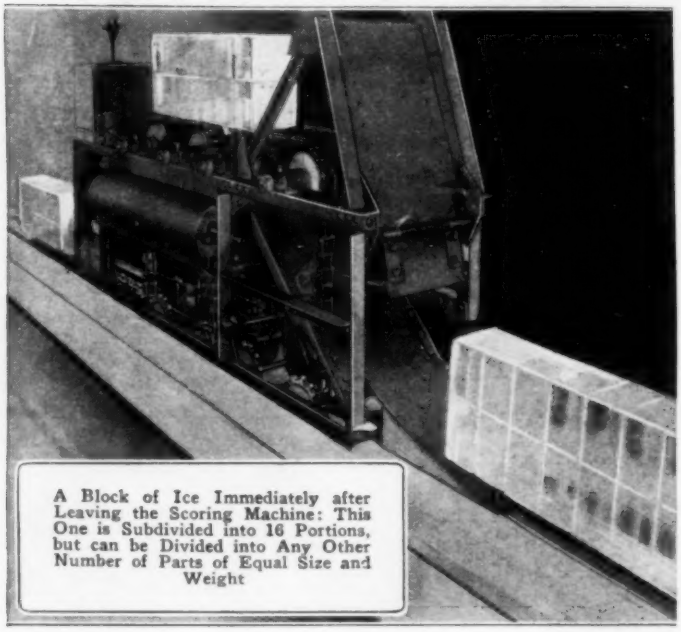
Determined to achieve superiority in shell racing, the state University of Washington has recently conducted experiments in the design and construction of shells which are said to be revolutionary.

Until new designs were introduced by Washington last year, there had been very little changes in the construction of racing shells since the first craft with a sliding seat was developed. English shells are constructed of sycamore, brought from France, and pine from Norway, and are planked with Spanish cedar, whereas Americans have substituted ash for sycamore in the ribbing. However, the conventional English design, with low forward deck, has been copied both in this country and abroad for several decades.

The new Washington shells are constructed of spruce and Port Orford cedar, materials also adopted for Yale's shells this year. The peculiar stroke of western oarsmen has influenced the design, and the Washington shells are being constructed with a pronounced bow lift. Western oarsmen are trained to check their shoulder swing and take the weight out of the bow of the shell the instant the stroke is finished. This tends to eliminate the plunging of the forward deck under the water—"sousing." In contrast, the English style is a longer, heavier stroke which gives a full body swing and carries the entire weight of the crew forward in the boat. The new Washington shells are designed to be sensitive to the quick check of the oarsmen's stroke.

On the new shells no bolts are used, braces being fastened to the frame with screws and rivets. The planking, which is only $\frac{5}{32}$ inch thick, is fastened with copper rivets. Use of spruce also is an improvement over Norway pine in that it has a finer grain, is tougher, and is obtainable in greater lengths. The keels on the new shells are $\frac{5}{8}$ inch thick, in 40-foot and 21-foot sections. The completed shells will weigh about 250 pounds.

ICE-SCORING MACHINE SAVES WASTE AND TIME



A Block of Ice Immediately after Leaving the Scoring Machine: This One is Subdivided into 16 Portions, but can be Divided into Any Other Number of Parts of Equal Size and Weight

An ice-scoring machine to facilitate the delivery of accurate weights of ice to consumers is now being placed on the market, and is said to be gaining considerable favor among ice cutters. The new machine is entirely automatic in operation, receiving the standard 300-pound cake of ice at one end and turning it out promptly at the other end, scored or divided into any desired number of pieces. It is then easy to disengage one of the smaller portions from the block without waste, and it is also obvious that the machine will save considerable time for the deliveryman.

NEW FACTORY BUILDINGS FORM UPWARD STEPS

With only one direction to extend its buildings and that direction upward, a German watch factory is literally growing uphill step by step. The factory is at Schramberg, in the Black Forest. As the growth of the business required additions to the building, they have been constructed one by one, each a little higher up the steep hill, till the roof line takes on the form of a flight of steps.

WAR-TIME "BULGES" NOW STABILIZE PEACE SHIPS

"Bulges" like those fitted to battleships during the war for protection against mines and torpedoes, are now being added to passenger liners by German shipbuilders to give greater stability by balancing the superstructure. The first large vessel to be built on this plan is the "Albert Ballin," a 620-foot passenger and cargo ship launched recently at Hamburg.

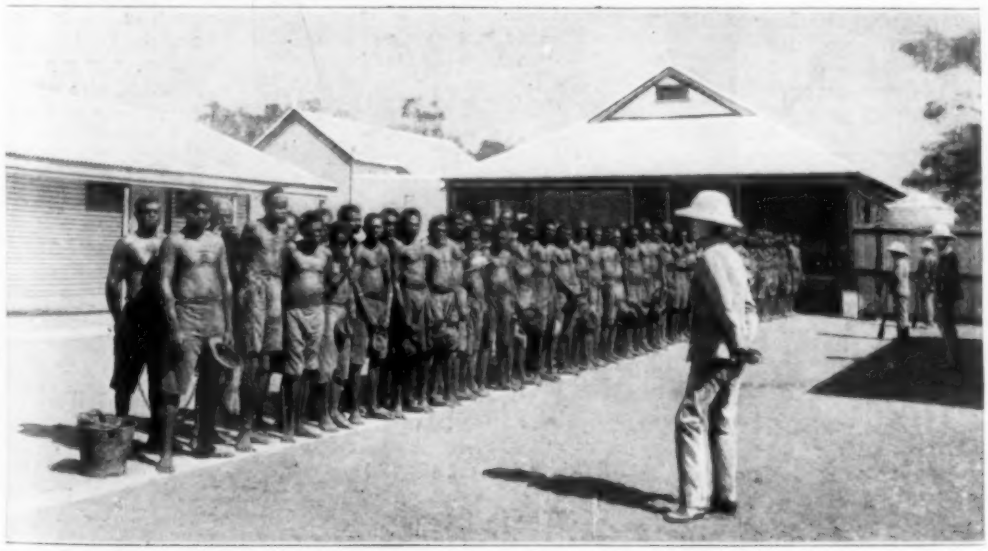
PHOTO BY GILLIAMS SERVICE

German Watch Factory Which Expands by Climbing a Mountainside in the Only Possible Direction: Its Growth is Marked by Additions Which Rise like Steps

Although More Like a Tropical Trading Station or Encampment, This Sunny and Pleasant-Looking Place Is Really a Jail. It is Situated at Broome, on the Northwest Coast of Western Australia, and Serves to Confine Offenders of the Aboriginal Population, or So-Called "Blackfellows"

AUSTRALIAN JAIL FOR "WILDMEN"

THE aborigines—native "blackfellows"—of Australia are born with a natural instinct to kill, and are consequently a great trouble to cattle breeders in isolated parts of northwestern Australia. They spear cattle for no apparent reason whatever, except to gratify their lust for killing. Occasionally, when the station owners endeavor to punish them, a white man is killed, and immediately a hue and cry is raised for the murderers. It usually takes months for the mounted-police trooper, who is responsible for law and order over a stretch of country many hundreds of square miles in area, to track down the blackfellow and bring him to justice. Such murders, fortunately, are few. However, the jail is usually full of offenders who are serving terms for spearing cattle, and various minor infractions of the law. The town of Broome, where the jail is located, is the terminus of an important highway and is situated on Roebuck Bay in the northwestern part of Western Australia, not far from the Kimberley gold field. This is the first paying gold field found in that province, and was reported by government geologists in 1882. Then started the gold rush to this part of the continent, which soon led to rich discoveries in other districts.



The Blackfellows Lined Up for Inspection in the Prison Yard: The Principal Crime of These "Wildmen" Is Cattle Killing. They Are Very Bloodthirsty and Spear the Cattle of the Ranchmen Apparently for No Reason Whatever, but Criminals of Minor Degrees are Also Kept Here

The Massive Stone Wall and Parapet of the Old Round Tower at Fort Snelling, Minnesota, Indicate Its Original Purpose of Indian Defense

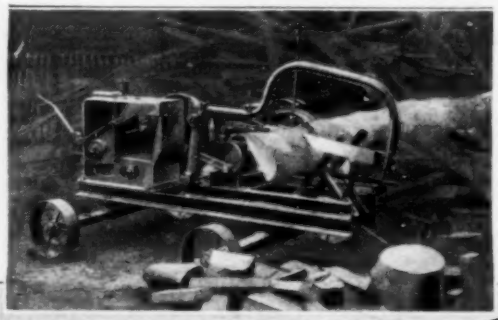
OLD STONE STRONGHOLD MADE INTO A HOUSE

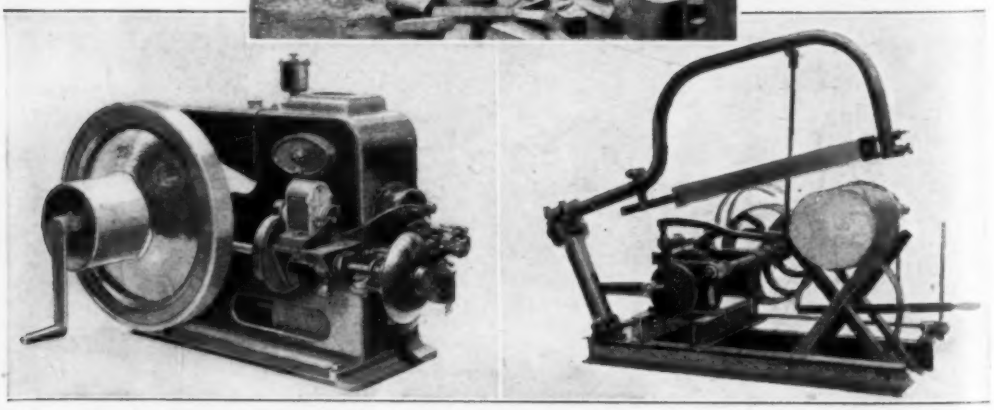
With its massive stone walls and parapet built for defense against the Indians, the Round Tower at Fort Snelling, Minn., on the Mississippi River, has stood for a hundred years in a perfect state of preservation. Now it has been remodeled into a home with modern conveniences for the post electrician of the fort and his family. It stands a few hundred feet from the river.

¶ The depth of natural-gas wells varies greatly, from less than 1,000 feet to over 6,000 feet, the deepest well now producing reaching 6,822 feet.

PORTABLE OIL ENGINE RUNS PUMP OR BUCKSAW

An unusually compact and well-planned oil-engine unit, of English make, which is specially suited for farm needs or construction work, has been placed on the market recently. The engine is designed to run a bucksaw, with which it is conveniently mounted on either a fixed frame or a portable truck. A feature is a locking attachment, consisting of a chain and self-holding lever, for gripping a log or any unevenly shaped timber without slippage. The saw requires practically no attention from the operator, as an automatic cut-off comes into play as soon as the piece of wood is severed. The unit, being entirely self-contained, can also be mounted for use as a portable pump, and when so used has a claimed output of 1,000 gallons of water per hour against a 100-foot head. The engine is of 3 brake horsepower, and must be started with gasoline. The less volatile fuel is, of course, turned on when the cylinder is warmed up.





Above: The Bucksaw and Engine at Work Sawing a Log, Both Mounted on a Truck. Left: Engine Alone Dismounted. Right: Saw and Buck for Holding Timber; Note the Locking Chain and Lever at the Right-Hand End

NEW YORK DRYDOCK TO EQUAL SIZE OF ONE AT BOSTON

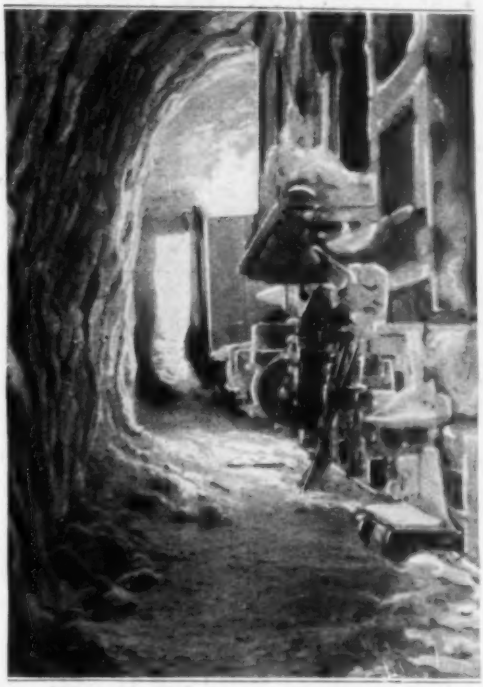
A drydock large enough to accommodate the largest vessels afloat will soon be built at New York. Plans calling for a dock of this description were recently approved by the directors of a well-known shipyard corporation. While the exact figures have not been given out, it is intimated that the drydock will be equal to, if not larger than, the navy dock near Boston, which is 1,200 feet long, 149 feet wide, and 45 feet deep.

ALASKAN RAILROADERS MUST BATTLE BIG DRIFTS

Railroading in Alaska in the winter season always proves to be a battle royal against the snow. The snow drifts badly in the cuts, then packs hard and freezes into walls that put up a strong and determined resistance before they are battered down by the snowplows. The White Pass and Yukon route is one of the lines that is hit the hardest by blizzards. It climbs a heavy grade, starting from sea level at Skagway and extending as far as White Horse, a distance of 110 miles.

In the dead of winter, operations are sometimes brought to a standstill because of the heavy fall of snow. The snow of itself would not be so bad if it were not for the sudden drops in temperature following the snowfalls. It often happens that the mercury will register 15 to 25° below zero at Skagway, and up at White Horse it falls as low as 60° below. This means that when a train crew starts out on a run, the members never know when they will get back to the starting point. Railroading in this far-northern region calls for foresight and first-class snow-fighting equipment.

Clearing the Right of Way after an Alaskan Snowstorm: This View Shows the Hard Pulling a Snowplow must Do When the Drifts Are as Heavy as This One



Tunneling in the Snow to Dig Out a Buried Locomotive on the White Pass and Yukon Route: Note How Firm and Hard the Frozen Side Walls Look

TANK SHIPS USING THE CANAL ARE ONE-EIGHTH OF TRAFFIC

Tank ships using the Panama Canal represented 12 per cent of the entire commercial traffic during 1922. These vessels carried about 1,500,000 long tons of cargo, or 10.4 per cent of all the cargo passing through the canal. The United States led in the number of ships and had 56.3 per cent of the total tonnage; Great Britain was second with 36.6 per cent, and Norway third with 4.3 per cent. However, only 55 per cent of the tonnage of tankers consisted of loaded ships, the remainder being ballasted.

ATTRACTIVE FLOOR LAMP MADE FROM ROPE

An attractive imitation floor lamp was made entirely from hemp rope recently by the stage manager of a Detroit theater. The whole is in the natural golden color of the rope. The shade is covered by a fine net of the same material, to hold the strands in place, and the stand is elaborately ornamented, a basket for flowers around the lower part of the upright being the principal feature.

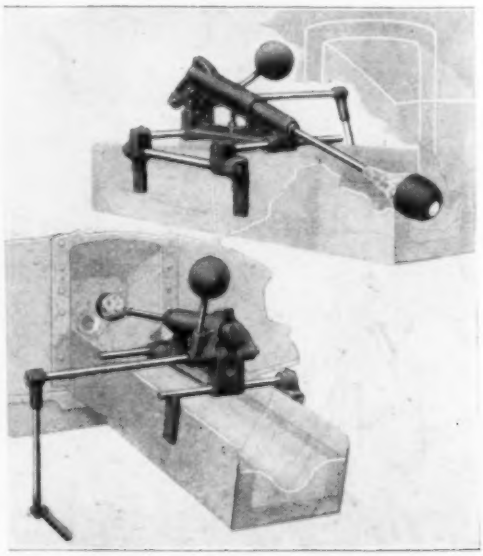
Imitation Floor Lamp Made from Ordinary Hemp Rope, the Natural Golden Color of Which Creates a Very Striking Effect

GALE LAYS BARE MUD ISLANDS IN BALTIMORE HARBOR

Land unseen for a generation or more was exposed to view in the vicinity of historic Fort McHenry, Baltimore harbor, during a heavy storm last February. Under the influence of a two-day northwest gale, reaching a velocity of 42 miles an hour, a quantity of water, estimated by harbor engineers at several million gallons, was blown from the harbor toward the Chesapeake Bay with the result that the water level at the city pier was lowered by 4 feet 4 inches, by actual measurement. The bar at Fort McHenry, normally submerged, was uncovered to the extent of more than an acre, and Mud Islands, ordinarily under water, showed above the surface along a frontage of nearly 2,000 feet. Vessels were unable to dock at the Clinton Street ferry because of the low water. Members of the harbor board, in boarding the official tug "Baltimore," found it impossible to step from pier to tug, as usual, and a ladder had to be used. Harbor work which is being done at the piers of the Pennsylvania Railroad, was visible for inspection, although the construction is considerably below the normal water level.

CUPOLA TAPPER AND STOPPER SIMPLE AND SAFE

In order to do away with the old hand method of tapping and stopping the flow of molten metal from cupolas, which requires experience and skill and is subject to accidents, a mechanical device has been developed. It consists of a piston-operated rod, with a cup at the end, into which is placed a composition ball that fits against the breast of the cupola when the flow is stopped. The piston movement is controlled by an arrangement of levers and rods that may be extended to some convenient point in the foundry. With this device, the flow can be easily gauged and effectively stopped. A counterweighted lever holds the ball in the desired position, and the whole device can be swung to one side for lining the spout or building up the breast.



Above: Cupola Tapper and Stopper Device in the Position When the Flow is Stopped. Below: Position When the Flow is Tapped

FLEXIBILITY OF CAR'S DRIVE SHOWN BY DEMONSTRATION

To show the flexibility of the drive of a new light motor car, a novel demonstration was made recently at Seattle, Wash. An ordinary hunting-case watch with the lid open was placed on the brick pavement of a level street and the motor car slowly driven forward. Barely moving, the car crept forward until the left front tire touched the lid of the watch. Then, even more slowly, the car advanced until the lid was forced down and snapped shut. Upon backing away from the timepiece, the driver picked it up and offered it for examination, and it proved to be undamaged.

During the demonstration the driver was aided with hand signals from a man crouching beside the watch. Five, four, three, two, and one-inch distances were signaled by the watcher with the fingers of his hand. When the tire had reached the timepiece, the signal was a shake of the hand. The driver then lined up with his eye a rivet on the running board with the edge of a brick in the pavement, and by thus sighting was able to gauge the movement forward of the car. An interested group of spectators witnessed this test, which reflected much credit on the driver's skill.

Above: Finger Signals were Used to Guide the Forward Movement of the Car. The Flagman is Signaling an Advance of Four Inches toward the Watch. Left: Close-Up of the Watch on the Pavement, with Its Lid Partly Depressed under the Advancing Car Wheel

EUROPEAN COOKING DEVICE DOES DOUBLE DUTY

With the object of saving every penny's worth of gas, a European invention makes a gas burner do double duty. A coil over the burner heats and circulates water through a double boiler beside the gas plate, and while the food in its upper part is cooking, another dish of food may be cooking over the burner.

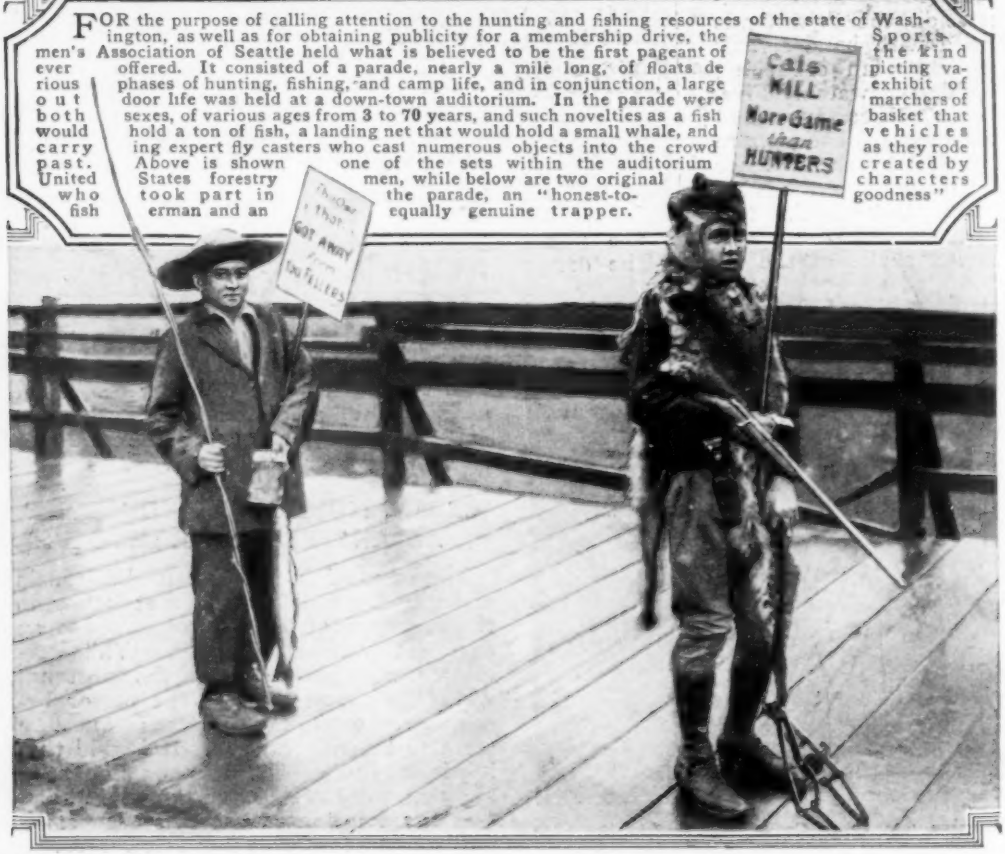
European Gas Saver Cooks with Double Boiler at Left, While Food is Cooking over the Burner

CLAIM HONEY IS EXCELLENT AS ANTIFREEZE REMEDY

Farmers of northeastern Wisconsin claim to have discovered that honey in the radiators of their automobiles is an excellent antifreezing agent. While certain chemists point out that the substance would gum and stick if the motor became overheated, the farmers in question seem to be well satisfied. It is said that 10 pounds of honey with an equal quantity of water will last through the winter, and that the solution is effective even at as low a temperature as 20° below zero.

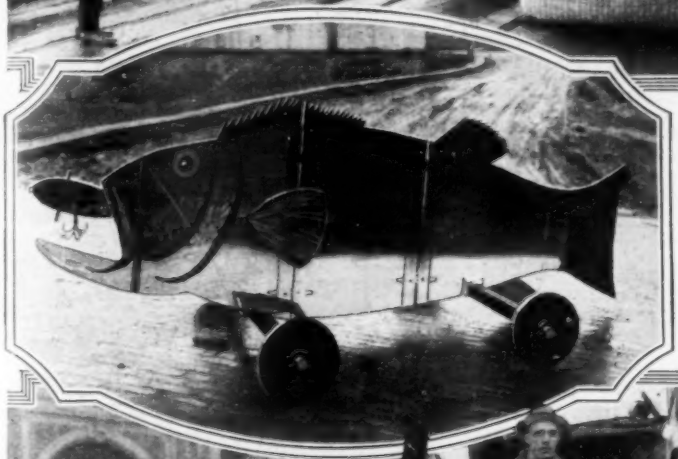
UNIQUE PAGEANT IS STAGED BY SPORTSMEN

FOR the purpose of calling attention to the hunting and fishing resources of the state of Washington, as well as for obtaining publicity for a membership drive, the Sportsmen's Association of Seattle held what is believed to be the first pageant of the kind ever offered. It consisted of a parade, nearly a mile long, of floats depicting various phases of hunting, fishing, and camp life, and in conjunction, a large exhibit of out door life was held at a down-town auditorium. In the parade were marchers of both sexes, of various ages from 3 to 70 years, and such novelties as a fish basket that would hold a ton of fish, a landing net that would hold a small whale, and vehicles as they rode ing expert fly casters who cast numerous objects into the crowd created by Above is shown one of the sets within the auditorium characters of United States forestry men, while below are two original goodness" who took part in the parade, an "honest-to- fish erman and an equally genuine trapper.

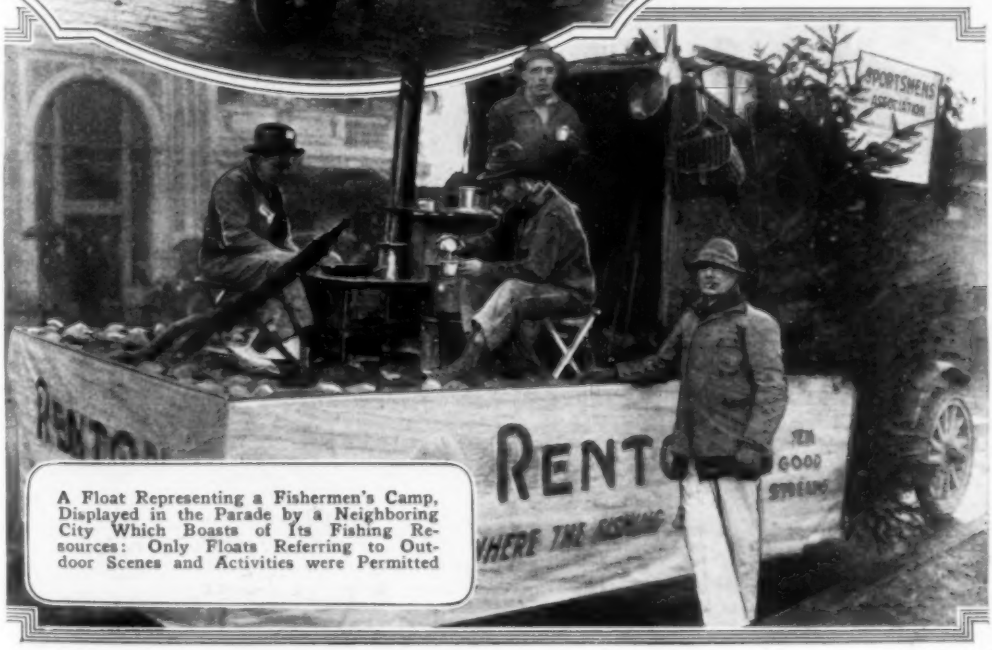


TO PROMOTE FISHING AND HUNTING INTERESTS

The Basket That would Hold a Ton of Fish, the 35-Foot Rod with Line and Reel to Match, and the Large Landing Net, Shown Below, Were Interesting Features of the Sportsmen's Pageant at Seattle



Another of the Unique Wheeled Devices That Appeared in the Parade is Shown at the Left. This Large Wooden Fish was Towed along the Street by a Fisherman, and Wriggled from Side to Side in Imitation of the Movements of a Bass Swimming through the Water



A Float Representing a Fishermen's Camp, Displayed in the Parade by a Neighboring City Which Boasts of Its Fishing Resources: Only Floats Referring to Outdoor Scenes and Activities were Permitted

WOODEN CASE DISPLAYS SEED PACKETS ATTRACTIVELY

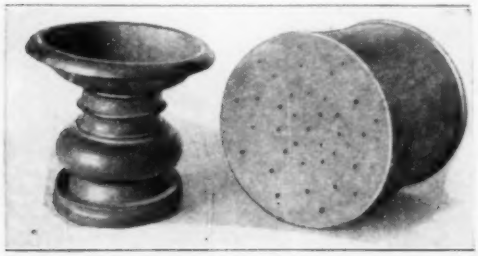
A new wooden case for displaying seed packets has one side for displaying vege-

Front of Self-Selling Seed Case: At Left, Shelf for Cash Register; Bottom, Compartments for Grass Seed, Corn, Beans, and the Like

table seeds, while the other holds flower seeds. Three 34-quart bins, pivoting outwardly at either side of the base, a projecting bracket, for supporting a cash register and with compartments for holding bags, at one end of the case, and three carton shelves at the opposite end, are other new features. The case stands about 6 feet high, and is 5 feet in length. There are eight rows of compartments on each side, their size increasing from the top to the bottom row. In all, they contain about 8,000 packets.

"SANDERS" ONCE USED FOR BLOTTING INK

Before the invention of blotting paper, writers with a pen were accustomed to the use of sand to dry the ink on a sheet of parchment or paper, and some receptacle for fine, dry sand was always found on the writing table. In the picture, two of these "sanders" are shown. The one on the left is of wood, over 125 years old. The other is of sheet iron and of unknown age. Sanders and quill pens were used in the same period.



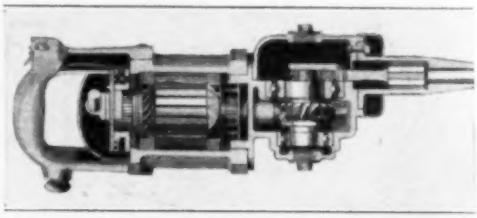
Forms of "Sanders" to Contain Dry Sand for Blotting Ink: Left, Wooden Sander, 125 Years Old; Right, Sheet-Iron Sander

FOUR-WHEELED ROLLER SKATES HAVE RUBBER TIRES

Standard-size roller skates with rubber tires, recently invented, are said to permit a greater freedom in fancy skating, and at the same time do away with all noise. The tires are of solid rubber, and secured by a flange so that they cannot work off. As with other types, the length of the skate can be adjusted to the size of the foot.

ELECTRIC RIVET HAMMER WORKS WITHOUT SHOCK

Wear and tear on vibratory equipment, such as rivet hammers, is always very severe, due to the shock which is transmitted thousands of times a day as the hammer blow is struck. In a new portable rivet hammer and concrete drill now being marketed, the effects of these hammer blows have been eliminated by automatically disconnecting the hammering member from the drive mechanism at the moment the blow is struck. At that instant the hammer rebounds from the blow, affording it a slight longitudinal movement which frees it from the drive, and therefore does not communicate shock to it.



Sectional View of Riveting Hammer and Concrete Drill, Showing Interiors of Motor and Driving Mechanism, and Ball-Bearing Journals

HERD OF GOATS USED TO PREVENT FIRE

As a means of fire prevention at the Naval Powder Factory at Indian Head, Md., a herd of Rocky Mountain goats are allowed to roam around the buildings, so that they may devour the dead leaves and other inflammable rubbish that otherwise would litter the ground. The goats effectively remove this dangerous material, as it is all that they have to subsist on.

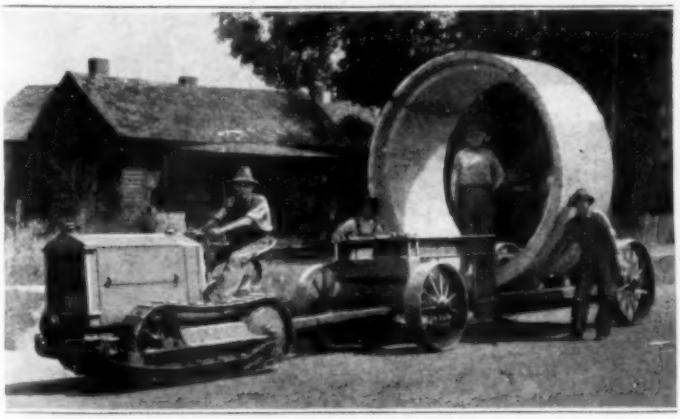
Part of the Grounds of the Naval Powder Factory at Indian Head, Maryland, Showing the Herd of Rocky Mountain Goats That Eat All Inflammable Rubbish That might Be a Cause of Fire

NEWLY ARRIVED CANARIES MUST PASS INSPECTION

All shipments of birds or other animals into the United States must pass the inspection of experts to prevent the importation of diseased or harmful specimens, and it is a rule which is carefully observed. This is specially true of canaries, which are inspected one by one. They come in large packages, each containing 21 rows of cages with one bird in each cage. Immediately on their arrival the cages are placed in the sunlight and the birds examined one by one. The cages of birds passed are marked with chalk to show that they are approved for sale.

Inspector Examining Foreign-Bred Canaries to Prevent Bringing In Diseased Birds

USE LARGE CONCRETE PIPE FOR CITY SEWERS



Transporting a Section of Concrete Sewer Pipe, 108 Inches in Diameter: One of These Pieces of Pipe Weighs About Six Tons

Concrete pipe for sewer construction has in recent months been used in large sizes by several middle-western cities. At one place over 1,000 feet of pipe, 96 inches in diameter, has been used, and at another, considerable pipe, 108 inches in diameter, has been laid. The 108-inch pipe weighs 3,250 pounds per foot of length, and the 96-inch pipe over 2,700 pounds. Considerable skill, of course, is required in the handling and laying of these heavy pieces.

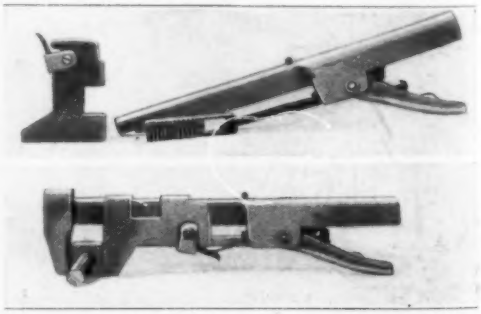
NEW EXPLOSIVE MADE FROM SAWDUST

A new explosive compound in which ordinary sawdust replaces the nitroglycerin used in most high explosives, has recently been announced by the chemistry department of the University of Washington. The discovery consists in the proper cooking of a mixture of sawdust and ammonium nitrate, which have long been known to form an explosive. It is estimated that the explosive can be made to sell at about one-third the cost of commercial dynamite, as neither the ammonium nitrate, which forms 80 per cent of the mixture, nor the sawdust making up the balance, is an expensive material. The new explosive apparently has the strength and qualities desired in a high explosive. It is claimed to be practically smokeless and that the fumes from it do not cause headache or other physical inconvenience to the user; that it can only be exploded by detonation, that it does not require thawing, and does not burn readily. An effort is being made to make a state industry of the manufacture of the new explosive, which would be distributed at cost for the benefit of farmers and others who use explosives extensively for clearing land and increasing the productivity of the soil. It has been recently demonstrated in public.

Above: Fir Stump, 14 Feet in Circumference, Used in Demonstrating the Effectiveness of the New Explosive Compound. Below: Result of the Explosion of 25 Pounds of the New Compound under the Stump

NEW MONKEY WRENCH WORKS FROM HANDLE

Several interesting improvements have been incorporated in a new type of monkey wrench recently developed and placed on the market. The usual nut for adjusting the jaws has been eliminated, being supplanted by a ratchet which is easily operated from the handle. A trigger at the back of the tool provides quick release of the jaws by disengaging the ratchet. The face of the upper jaw is curved and corrugated, so that the tool can also be used as a pipe wrench when necessary.



Above: The Lower Jaw of This Wrench has been Removed and Set Up on Its Face, for Use as a Jack. Below: The Assembled Wrench, Showing the Trigger Release and the Ratchet Handle

Self-Propelled Railway Car, Which Runs on Gas Generated from the Unburned Carbon in the Ashes Dumped from the Ordinary Type of Locomotive: It Carries Its Own Gas Producer, Internal-Combustion Engines, and Electric Generators That Supply Current for the Motors

SELF-PROPELLED RAILWAY CAR RUNS ON WASTE FUEL

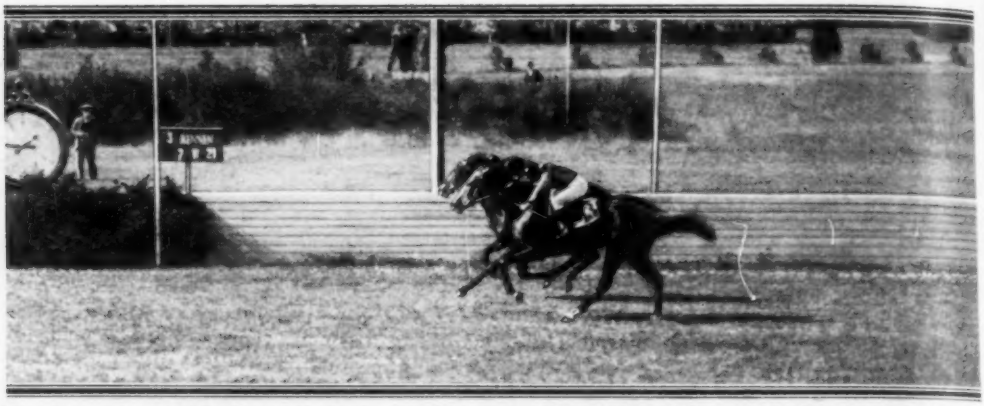
An electric-motor-driven railway car that generates its own electricity has been satisfactorily operated by a South African railroad. The unburned carbon in the ashes dumped from the grates of the regular locomotives, is used as fuel in a producer which generates gas for internal-combustion engines. The engines are connected to electric generators which furnish current to run the two 35-horsepower motors. The control is about the same as in the ordinary street car, and one man can operate the car. The first car weighed about 30 tons, and as it was of an experimental nature, was constructed of such standard equipment as was easily obtainable. Because of the relative scarcity of fuel, the car was developed to meet the need of an economical unit for operation on branch lines.

AUSTRALIAN RABBIT FENCE COVERED BY SAND

Just as snowdrifts cover fences in northern latitudes, the shifting sands in Australia cover the fences erected by the government to keep out the hordes of rabbits which devour the crops. To such an extent does this condition prevail that the fence of wire netting between Queensland and New South Wales has been wholly covered and the drifts of sand have crept part way up a second fence built on top of the first. Now it is proposed that the Australian Commonwealth float a loan of $15,000,000 to build more rabbit fences.

Original Boundary Fence in Australia Covered by Sand Drift, Which is Creeping Up on the Second Fence

¶ Estimates of the available amount of coal in the world will need revision, according to reports from the Belgian Congo, where two coal deposits estimated at over one billion tons are reported to have been discovered. One is 16 feet thick.



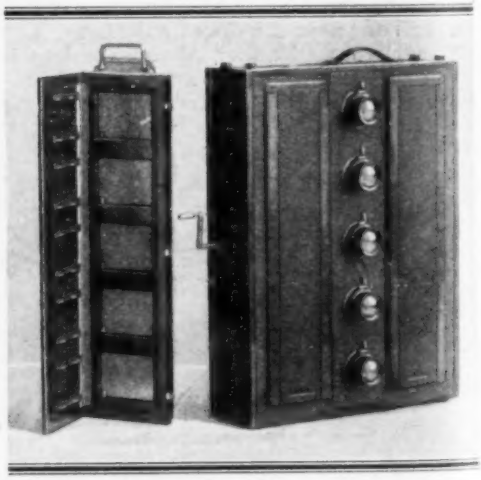
Two Horses Running Neck and Neck at the Finish of a Close Race: Without the Use of the Quintuple Camera, It Is Often a Matter of Compromise among the Judges in Declaring the Winner in a Finish Like This One

ADJUDGING HORSE RACES BY PHOTOGRAPHY

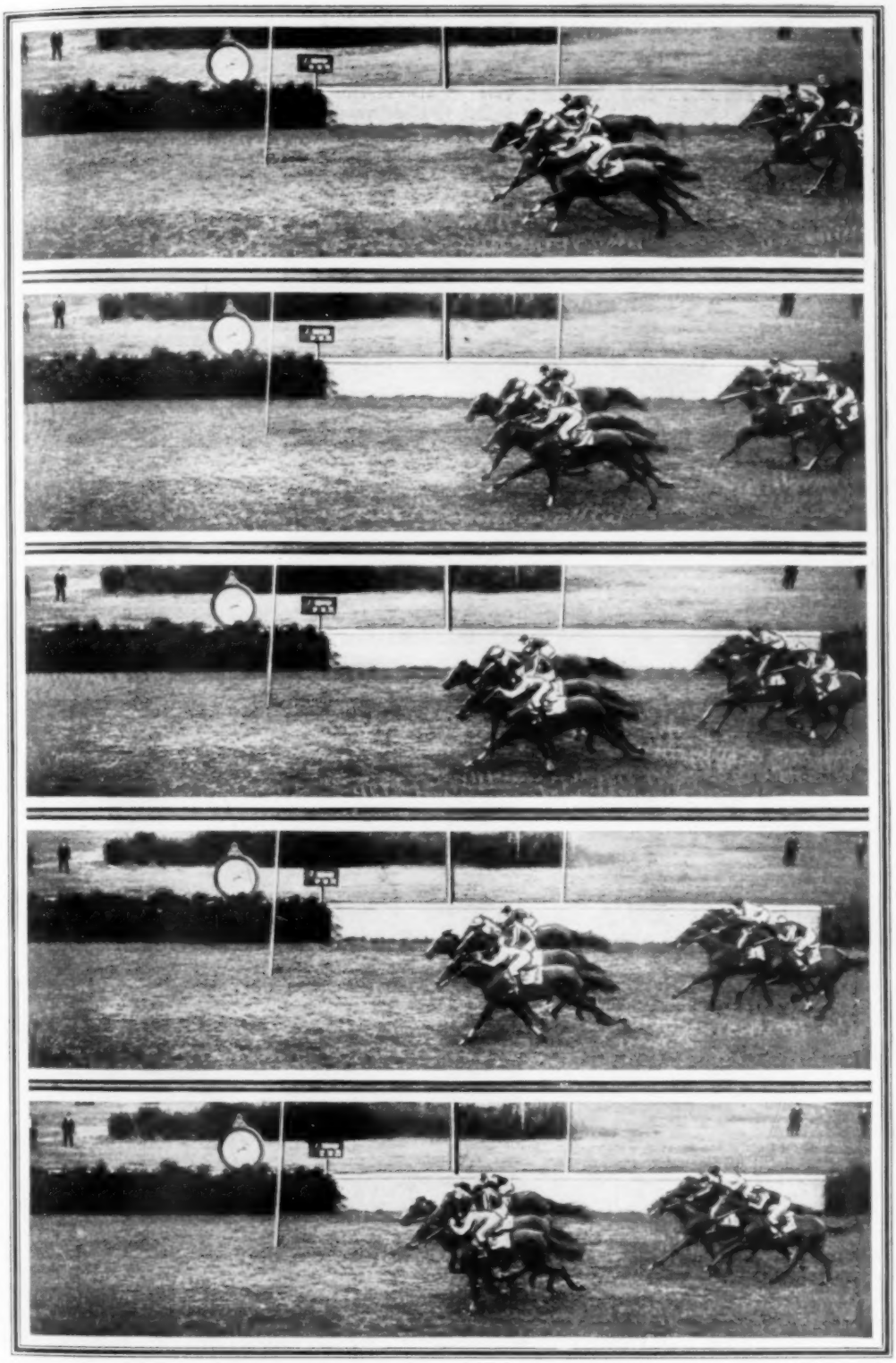
WHEN a group of race horses cross the finish line nose to nose it is difficult to determine the actual winner.

Judges Stand with Two of the Special Cameras Mounted One above the Other

To obviate this difficulty and to eliminate all disputes, a well-known German camera maker has developed a special camera for taking pictures of the finish of a horse race. A moving picture is not wholly satisfactory because it is not fast enough. Experience shows that it is desirable to take a series of five pictures while the horses are moving two yards, and when it is remembered that horses can do nearly 20 yards a second, it means that these five pictures must be snapped in a tenth of a second. To attain this result, five objectives are arranged one above the other and are provided with very fine, large lenses, and extremely fast shutters, capable of a speed of $\frac{1}{13,000}$ second on a sunshiny day. The cameras are adapted to taking snapshots even when it is dusk. Special arrangements have been made so that a finished picture can be delivered 7 or 8 minutes after the race is finished. The camera is operated electrically, and the intention is to snap the camera so that the middle of the series of five pictures will show the horses crossing the finish line. Two cameras are used, so that if anything happens to one set of pictures, the other set is available.



Five-Story Camera, Designed to Take Five Pictures in Rapid Succession, So as to Record Accurately the Winner of a Horse Race



From the Top Down, These Pictures, Which were All Snapped within an Interval of One-Tenth of a Second by the Electrically Operated Quintuple Camera, Show Progressively a Number of Closely Bunched Horses as They Approach and Cross the Finish Line

WATER BARRELS OF CONCRETE ADOPTED BY RAILROADS

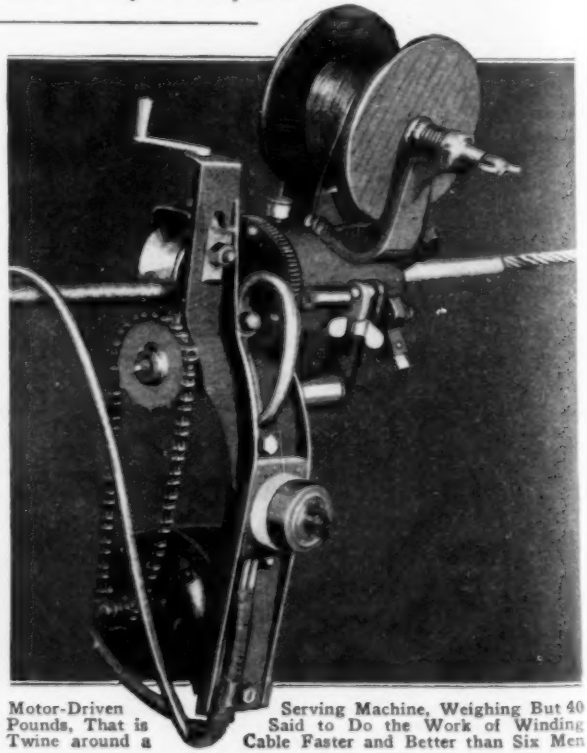
Through the western timberlands, over precipitous mountains, and across arid country, railroads have found some difficulty in maintaining their water barrels, a necessary means of protecting isolated bridges and bridge decking, as well as other structures, against fire. In hot climates the evaporation of the water is very bothersome, while up in the mountains the storms are severe, and at times the wooden barrels are destroyed or blown away.

An interesting type of concrete water barrel has been introduced lately on several of these railroads. The barrels are cast in concrete in much the same manner as a concrete irrigation pipe, reinforced with a heavy basket of galvanized-metal fabric in the center of all the walls. Those in use on the Union Pacific system, and on the San Diego and Arizona branch of the Southern Pacific, have a diameter of 24 inches and a depth of 30 inches. The walls are 2½ inches thick, and the weight is 796 pounds. Each barrel holds 60 gallons. While this type is expected to be especially useful because it will decrease evaporation, it is also thought by some that the weight will be an advantage in that it will be too heavy for marauders along the right of way to carry off.

Concrete Water Barrels Which are being Introduced on the Union Pacific System, and on the San Diego and Arizona Branch of the Southern Pacific: Less Evaporation Is One of the Benefits Expected

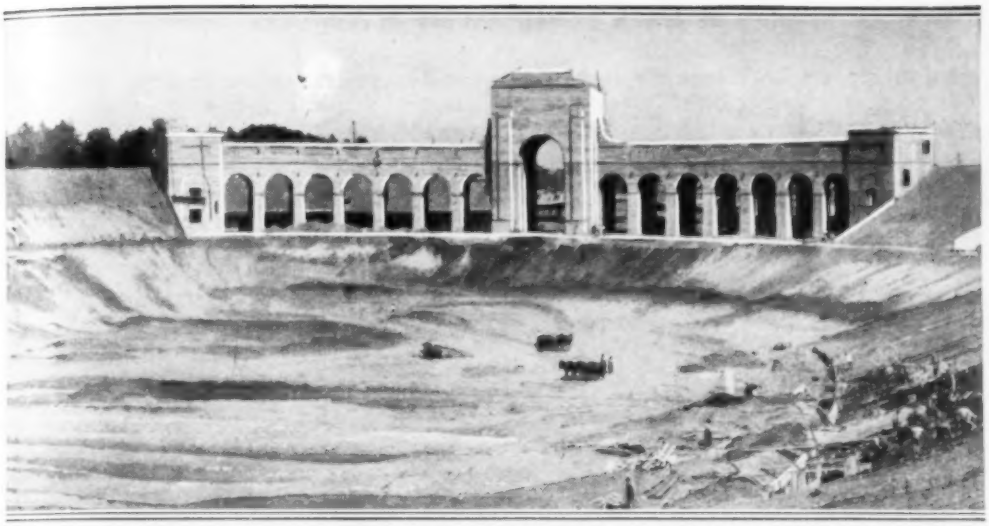
AUTOMATIC SERVING MACHINE SAVES TIME AND LABOR

A clever device, called a serving machine, has been patented for winding twine and other material on marline-wound cables. Actuated by a ⅙-horsepower motor, this little machine can be started at the end of a long cable and will automatically travel to the other end, winding the protecting material on the cable as it goes. It is said to do the work faster and better than six expert riggers could, and as the first cost and maintenance are low, it is thought that it will increase the use of marline-wound cable. The machine was developed by a former navy-yard rigger.



Motor-Driven Serving Machine, Weighing But 40 Pounds, That is Said to Do the Work of Winding Twine around a Cable Faster and Better than Six Men

¶The Hippodrome, New York's famous playhouse, considered one of the largest in the world, is to be torn down and a $15,000,000 hotel built in its place.



Main Entrance of Los Angeles Stadium, Which, It is Said, will Be the World's Largest Amphitheater: In the Foreground Appears the Excavation for the Bowl, and on the Right Forms for Concrete Construction. The Illustration Gives a Good Idea of the Size

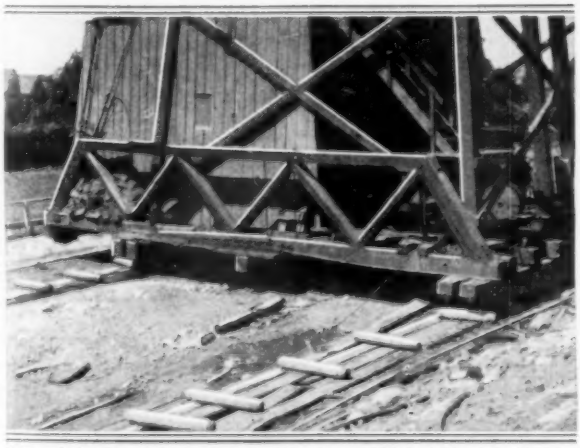
GREAT LOS ANGELES STADIUM TO SEAT 75,000

BY FRANK B. HOWE

FACED with the problem of erecting the largest colosseum in the world—a stadium of the bowl type—at Los Angeles on a plot of land absolutely flat and without any of the natural advantages which often help stadium builders, the contractors devised an efficient working plan.

A huge derrick, nearly 150 feet in height, featured the first stage of the work. It was mounted on rollers on a track encircling the site of the stadium. From the operating engine at the bottom of the derrick a cable was run to the top and thence out to the middle of the stadium. A scraper bucket of extra size was hung on this cable. Starting with the derrick and bucket, the earth was gradually worked from the middle to the outer edge of the arena, lowering the middle and raising the sides. On being placed in position, the scraper digs itself in as it is filled with earth, and when full, the cable drags it to the place where it is to be dumped. Then by reversing the cable, the bucket is returned. As the stadium site is lowered in the middle and raised on the sides, the derrick is moved along on the track and the same op-

Towering Derrick Used to Operate Bucket for Excavating, and Endless Cable on Which the Bucket Moves



Base of the Derrick, and Roller Track on Which It Traveled in Excavating and Filling for the Bowl of the Stadium: As the Middle was Excavated and the Sides Filled, the Derrick was Moved

eration repeated. When the hollowing-out process is finished, the interior of the bowl is smoothed.

Bowl of Stadium during Construction: Note Rim, 79 Feet High, in Background, Compared with Derrick behind It; Also Forms for Concrete Construction in Left Foreground

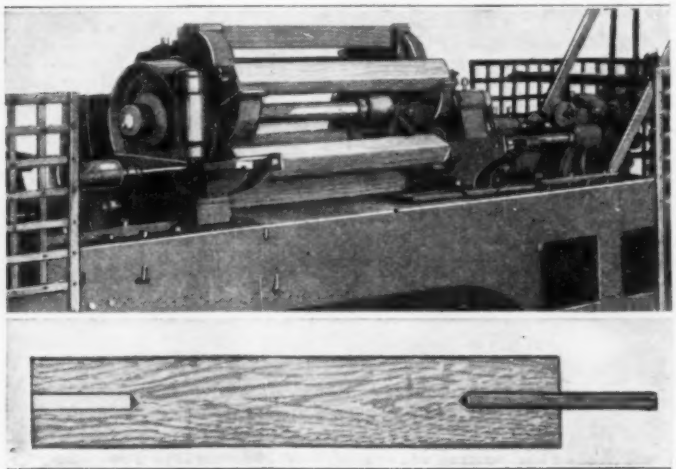
With the bowl of earth replacing the level ground, it is a simple operation to line it with concrete, build in seats and a stage, provide the minor requirements, and complete what is said to be the largest amphitheater ever erected.

The middle was excavated to a depth of 32 feet, and the sides rise to a height of 79 feet. The length of the stadium is 1,080 feet and its width 644 feet. It will seat 75,000 spectators who come into it through 103 entrances to fill the 65 rows of seats while they watch the players in the athletic field, 344 by 688 feet in size. Concrete to the amount of 27,000 cubic yards will be used in the construction of the stadium, and its cost, it is estimated, will be about 800,000 dollars.

The stadium will have its first use in the try-out games for the Pacific section in 1924 for the Olympic games in France the same year. And since the stadium is built, the people of Los Angeles hope to secure the international Olympic games of 1928 as an event worthy of the new arena.

MACHINE DRILLS HOLES AND INSERTS PINS

What is known as a gudgeon-drilling and inserting machine has been developed for automatically doing work that ordinarily requires a number of hand operations. The new machine is used principally in the manufacture of wooden rollers. In the middle of the machine is a revolving carrier into which the operator puts the blank pieces of wood. At each end of the machine is a drill spindle carrying a long drill, which makes a hole in each end of the blank piece. The carrier then makes a part revolution, and two other spindles with pusher rods force the pins, or gudgeons, into the holes. The machine is operated by means of cams, and all the operator has to do is to put in blank pieces and remove the finished ones.

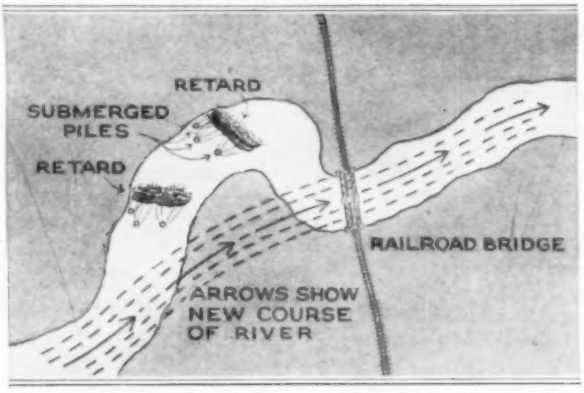


Above: Gudgeon-Drilling and Inserting Machine Which Is Automatic Except for the Placing and Removal of Pieces on the Carrier. Below: Wooden Roller with Holes Drilled and One Gudgeon Inserted

ENGINEERS CHANGE COURSE OF RIVER IN INDIANA

One of the "Retards" Used to Change the Course of the White River in Indiana: Note How the Brush is Held in Place by the Cables Leading to Submerged Piles. The Railroad Bridge can be Seen in the Background

An interesting method of making a river behave itself is being used in straightening a bend in the west fork of the White River at the Baltimore and Ohio Railroad bridge, some 12 or 15 miles east of Vincennes, Ind. Some years previously, the river at this point had changed its channel, so that it no longer flowed toward the bridge but threatened to eat its way into the railroad grade, a short distance beyond. Carload after carload of rock had been dumped into the river at the point menaced, but with every high water the rock was swept away, leaving the spot again unprotected.



Map Showing the Change That was Made in the Course of the River: The Broken Lines Indicate the New Channel, and the Arrows the Direction of Flow

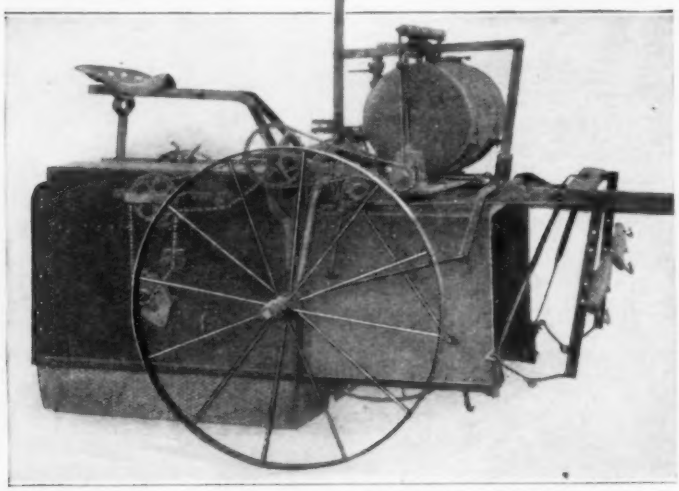
To solve the problem, the engineers engaged cut scores of small trees, and, by means of a cable and hoisting machinery, lowered the trees into the river at the bend. These, fastened together by wire, were made to form two "retards," or brush dams, anchored about 300 yards apart, and extending about two-thirds across the river. As a result of this work, the river current has taken such a course that the new channel is expected to run straight to the railroad bridge.

HYDROELECTRIC POWER PLANT NORTH OF ARCTIC CIRCLE

The hydroelectric power plant maintained by the Norwegian government at Glomfjord has a peculiar interest on account of its location 30 miles north of the arctic circle, as well as for its features of construction. Several large lakes into which glaciers discharge, serve as a natural reservoir from which water is carried in a tunnel, 9,050 feet long, with a cross section of 192 square feet. Two penstocks of welded steel lead to the power house on the coast, giving a head of 1,542 feet. Two turbines have a rated horsepower of 25,000 each, and the third 27,500 horsepower. Current is carried three miles to the point of consumption on two three-phase lines. The cost of the installation was $5,600,000. The plant has a watershed of 96 square miles.

LIQUID OR POWDERED POISON SPRAYED ON COTTON

Poison, in either liquid or powdered form, may be efficiently sprayed on cotton plants by the use of a recently introduced machine. The outfit, consisting of an air pump, blower, spraying nozzles, liquid and powdered-poison receptacles, water tank, and apparatus for directing the sprays, is mounted on two high metal wheels and may be drawn by either horses or a tractor. The usual procedure is to treat the cotton early in the morning while the dew is yet upon the plants, spraying powdered poison upon them. When the sun has dried the dew from the plants, they are moistened with a water spray so that the powder will adhere, or liquid poison is sprayed directly from the nozzles. The appliance may be used also for any other plants that are cultivated in rows and are not of too great height.



Machine for Spraying Cotton Plants with Poison, Which may Be in Either Liquid or Powder Form: The Liquid is Forced by Compressed Air through Nozzles, and the Powder Blown onto the Damp Plants

X-RAY MOVIES ATTAIN HIGHER PERFECTION

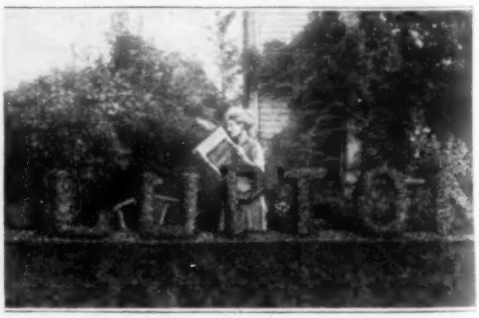
According to competent medical authority, new developments in X-ray movies have been achieved by the use of a new method of sensitizing the photographic plate so as to record new wave lengths never before photographed. Fine details in bone structure have been revealed by the new method, and it is hoped that injuries and pathologic changes, to which the ordinary X-ray plate is blind, will be recorded after further experimentation.

WEIGHTS THAT GROW PUZZLE BUREAU OF STANDARDS

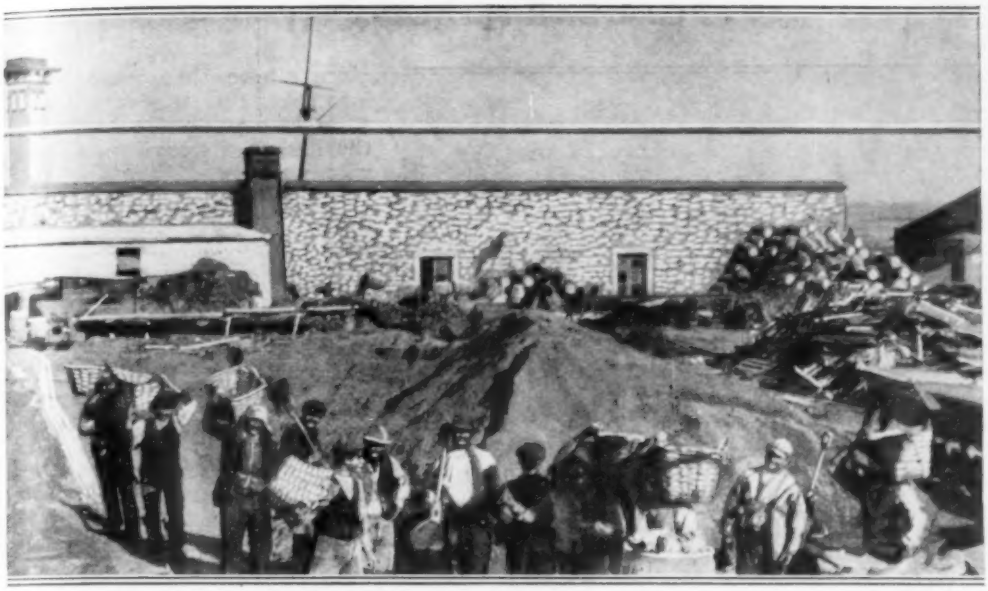
A curious case of weights that have been increasing in weight has been the subject of investigation at the Bureau of Standards for some time. The three weights were part of a set obtained with a balance at the Seattle, Wash., assay office of the Treasury Department, and their increase in weight was found to account for discrepancies in values given by the balances after being in use a short time. The fact that the other weights of the set showed no such variation, and that the rate of increase was not uniform, complicates the problem. In the first year there was a total gain of about 5 grains for the three weights, and about 7 grains in the next seven months. The next two months produced an increase of approximately 1 grain. No satisfactory solution has as yet been found.

HEDGE TRIMMED TO FORM HOUSE OWNER'S NAME

Allowing the hedge about his house to grow to a suitable height in several places, a resident of Shiloh, N. J., clipped the excess growth to form the letters of his name. While not detracting from the appearance of the surroundings, this has lent a touch of individuality and distinctiveness to the house.



A Resident of Shiloh, New Jersey, Cut the Upper Part of the Hedge at the Front of His Home into Letters Forming His Name



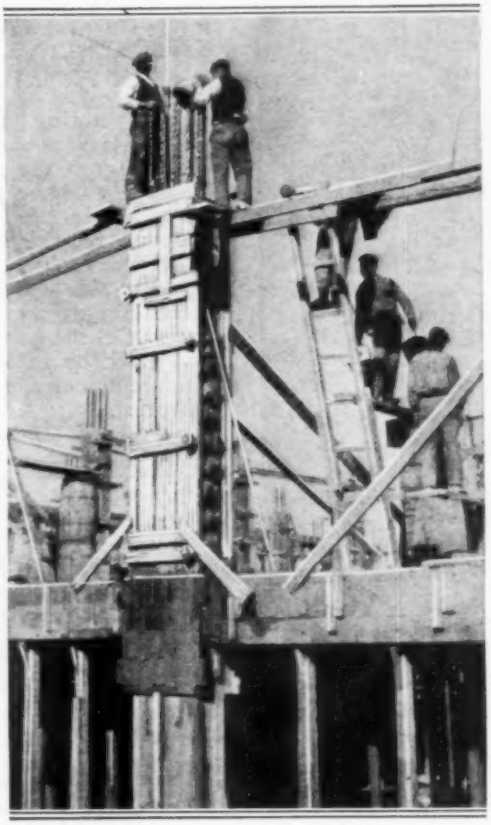
A Group of **Argentinians with Baskets Which They Used to Transport Sand and Gravel to a Pit Where Concrete was Mixed for the Construction of a Packing Plant**

BUILDING A PACKING PLANT BY HAND

BY D. C. RETSLOFF

ARGENTINA, the second largest country in South America, takes precedence over all other South American countries in cattle and sheep raising and in the production of beef, mutton, and wool, and has one of the largest meat-packing and cold-storage plants on the continent.

La Plata, a city of 110,000, situated at the mouth of the river Plata, is the home of this plant which was built in an extraordinary way. During the recent war, the Argentinians did not favor the idea of foreign capital bringing industries into their country. Local laborers would not work with Americans, neither would they countenance the use of labor-saving devices or machinery. The only way the packing company could erect its plant was by agreeing to employ an entire crew of resident laborers and to allow the work to be done in the old-fashioned manner.



Argentinian Workmen Carrying Concrete in Buckets up a Ladder, and Pouring the Concrete into Forms

The population of La Plata is almost entirely Italian, French, and Spanish. American foremen found this class of labor slow and stubborn. There were as many different "work spots" as there were materials. For instance, the rock and sand were unloaded at the dock as far apart as possible; the cement was piled at another point; large rocks were carried in a sort of litter to a

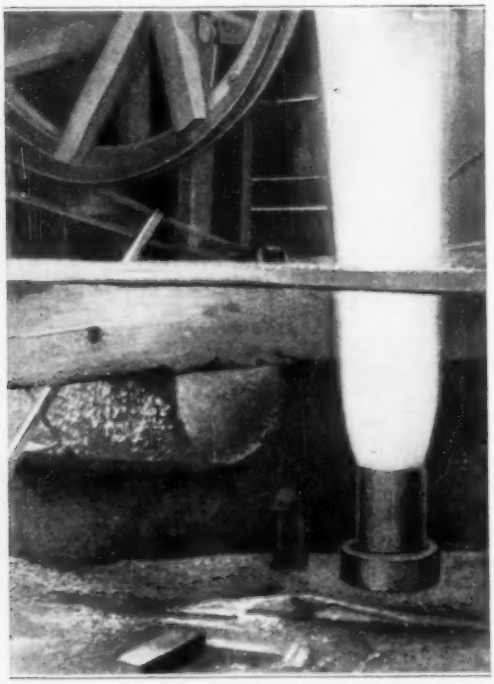
Two Workmen with a Litter Used in Carrying Rocks for the Building of the Hand-Constructed Packing Plant at the City of La Plata in Argentina

place where they were broken into bits; sand and small rocks were transported in baskets on the heads of workmen, to a pit where they were mixed with the cement. Then the concrete was carried in small buckets up ladders, where it was poured into the forms.

The cost of erecting this three-story plant was close to $250,000. Among the 200 men employed in its construction, there were no Americans except the contractors and the skilled machinists. This work offers an interesting contrast to the modern methods used on a construction job in the United States.

PHOTOGRAPHER RISKS HEARING TO SNAP LARGE GAS WELL

The workmen who finally succeeded in "shutting in," at Byron, Wyo., what is



Gas Well Lately "Shut In" at Byron, Wyoming, the Vibration from Which Seriously Endangered the Hearing of the Cameraman Taking This Picture

claimed to be one of the largest gas wells in the country, found it necessary to place pieces of wood between their teeth to keep them from chattering as a result of the vibration. And when a photographer recently took a chance at a close-up, he was warned to take not only this precaution but also to fill the outer ear passages with grease, and to bandage them. This to prevent the vibration from breaking his eardrums.

INTERESTING AMPHITHEATER IN FRENCH HOSPITAL

An operating amphitheater covered with a glass cupola, around the outside of which are the students' chairs, is a feature of a French hospital. The operating table is at the center of the theater. From above, the students watch, either looking directly at the table or seeing the other side by glancing in the mirrors placed about the base of the cupola. Meanwhile, the progress of the operation is reported by an attendant using a telephone, connected to loud speakers in the auditorium.

CORNELL FINDS IT DIFFICULT TO REPLACE BROKEN OARS

An oar famine faces Cornell University, and Coach John Hoyle has not yet found a supply of spruce sufficiently good to stand the strain to which racing oars are put. These oars are made of white spruce, and the blocks from which they are manufactured must be at least 18 feet 6 inches long, 6 inches wide, and 3 inches thick. As, in addition, the grain must be perfectly straight, and the growth rings small and regular, it has proved difficult to find wood able to meet these requirements. The oars are finished at the university boathouse.

A Bird's-Eye View of the Mammoth 20-Acre Oil-Storage Tank under Construction, Which will Hold 1,750,000 Barrels of Oil When Completed: Its Roof will be Supported by Wooden Poles Set in Concrete Blocks in the Tank's Bottom. The Three Circular Tanks in the Background Are of 500,000-Barrel Capacity

GIANT CONCRETE OIL TANK HAS VERY THIN WALLS

A huge reinforced-concrete oil-storage tank, nearly 20 acres in extent, is rapidly nearing completion in California, and will have a capacity—claimed to be the largest in the world—of 1,750,000 barrels of oil. The depth of the tank will be 16 feet, of which half will be below the ground. A remarkable feature of the construction is that the sides and bottom of the tank will be only 4 inches thick. This was made possible by the extremely careful and ingenious method of preparing and compacting the ground under and around the tank site. Special-treaded tractors were used to repack the soil left at the bottom, which resulted in greatly increasing its density. In this way the concrete in contact with the ground serves mainly to retain the stored oil, transmitting most of the pressure to the previously compacted soil.

NEW RUST-PROOFING PROCESS FOR IRON AND STEEL

A new rust-proofing process for iron and steel consists in electroplating the articles with a coating of metallic cadmium, varying in thickness from .0001 to .001 inch. After plating, which takes about 10 minutes, the article is baked for two or three hours at a temperature of 300 to 400° Fahrenheit. This causes the cadmium to form an alloy with the iron or steel surface, which is highly resistant to atmospheric corrosion.

POLICE "DEAD LINE" BARS SHOPLIFTERS

Shoplifters in New York City have become so numerous and expert in plying their trade as to compel the police department to establish a "dead line" around the shopping centers. Persons with known criminal records found within these areas are arrested on sight. One of the methods employed by the expert shoplifter is to use an artificial hand as a decoy to distract the attention of the salesperson, while the concealed real hand stealthily tucks away whatever it can reach.

HOME ON TREE STUMP BUILT BY CIVIL-WAR VETERAN

Rather than pay high rent for living quarters, a Civil-War veteran of California, 75 years old, has built his own

How an Old Soldier Beat the High Cost of Living: High off the Ground This Civil-War Veteran has Built His "Roost," with All Modern Conveniences

home in a tree. The stout branches were sawed off about 12 feet from the ground, and these, together with the tree trunk, form the foundation. The house itself consists of a combined kitchen and sitting room, and a bedroom, the former having running water and a gas stove, while both rooms are electrically lighted. Stairs lead from the ground to the porch of the "first floor," and another smaller stairway at the back leads from this floor to the "roof garden," a fenced-in portion on the roof fitted with chairs and a bench.

¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

STREET GAS CUT-OFF VALVE FOR NEW YORK BUILDINGS

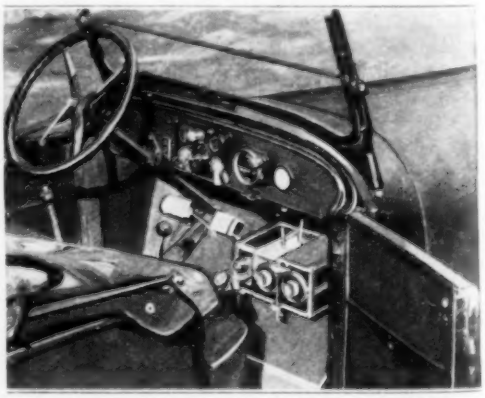
A gas cut-off valve on the exterior of all residential buildings exceeding five stories in height, will be required on all houses of this description in New York, if a bill recently passed by the board of aldermen is signed by Mayor Hylan. It is understood that he will sign the measure. The sponsors of the bill claim that it will protect the lives of firemen.

U. S. PETROLEUM CONSUMPTION BREAKS PREVIOUS RECORDS

The petroleum consumption in the United States during 1922 was more than 586,000,000 barrels, a new high mark for this oil. A record American production of more than 550,000,000 barrels, and an unusually large import, are also reported. The exports totaled 10,223,000 barrels.

RECORDING INSTRUMENT SHOWS CONDITION OF ROAD

An interesting type of recording instrument has been developed recently to aid highway officials when making surveys of road conditions. The device is intended for use in an inspection car, and is mounted on or near the dashboard, so that it can be connected readily to one of the front wheels. Two recording pencils are actuated through connection with the front axle, and indicate the "ups" and "downs" of the road on a continuous chart scaled 1 inch to 50 feet of travel. The penciled record is in plain view at all times.



An Automatic Recorder of Road Conditions: A Clutch is Provided So That the Instrument can be Operated or Disengaged at Will

WINGLESS AIRPLANE TAXI MAKES TRIPS OVER SNOW

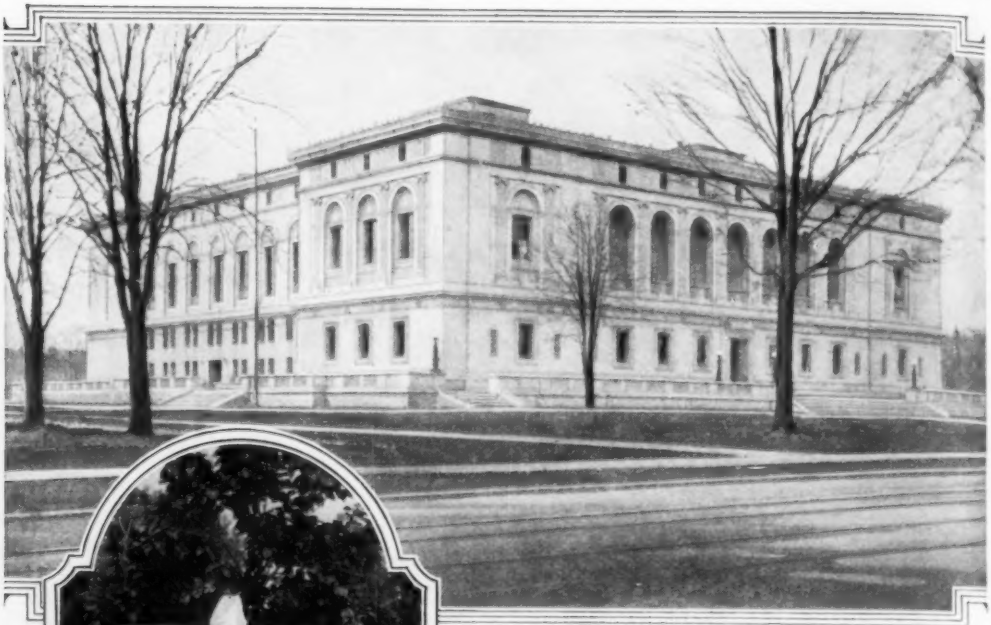
AN airplane fuselage, mounted on skids, was in use last winter as a taxi at Truckee, Calif. It operated on short pleasure trips in the vicinity, and also ran, over snow, to Lake Tahoe, a resort some 14 miles away. The machine, which carried four persons including the driver, sometimes made 120 miles an hour on straightaways, but, of course, had to slow down to about 85 miles on roads in order to negotiate the turns. Steering was by the usual aerial rudder, while a drag arrangement served as a brake. So successful has the builder and operator been that he plans to place four such machines in commission next season.

DAMAGE TO BRIDGE CAUSES SACRIFICE OF TREE

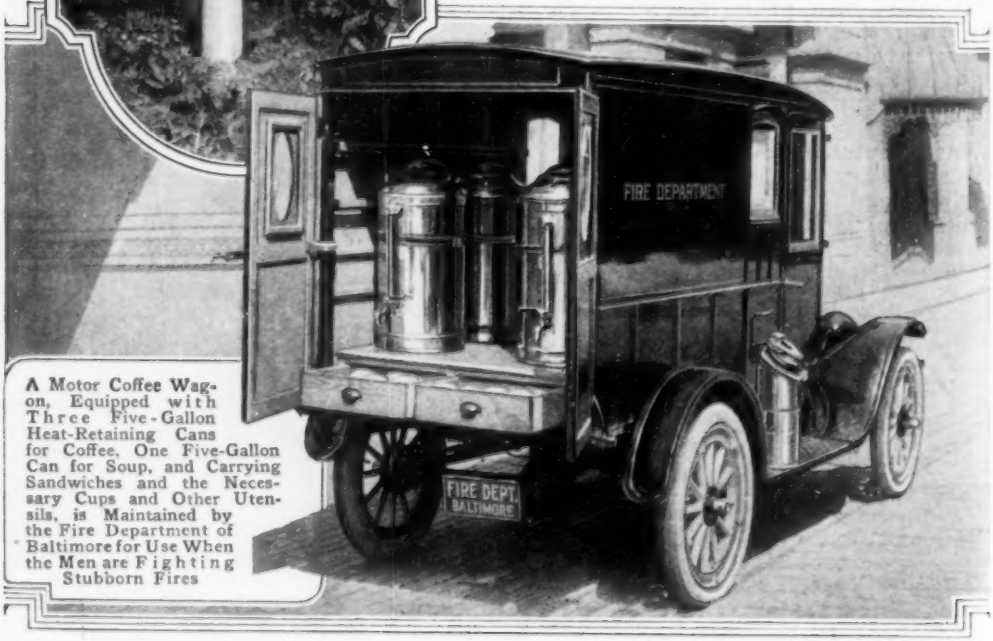
The associations clinging to a tree which had provided shade and a resting place for many years were not sufficient to save it when the tree's roots damaged the abutment of a bridge on a state highway crossed by hundreds of automobiles daily. The force of its growing roots spread the rock and filling of the bridge abutment, so that when high water came, part of the abutment was carried away. Thousands of spectators watched the felling of the tree. The bridge was moved downstream on rollers, and is in use while a new one is under construction. Then the old bridge will be dismantled.

¶An immense airship hangar recently completed at Scott Field, Ill., for the U. S. Army, is 810 feet long and 206 feet wide, with a clear height of 150 feet at the center. All-steel construction, motor-operated doors, and towing trolleys are features.

The Roots of This Tree beside a Trunk-Highway Bridge Destroyed the Wall of the Abutment, as Shown; Hence It was Removed When a New Bridge was to be Built



Above: The Beautiful New Public Library of Detroit, Erected on Woodward Avenue, the Most Prominent Thoroughfare of That City. The Exterior Is of White Marble, and the Building Cost Approximately $2,750,000. Detroit Is More Fortunate than Some Other Large Cities in That It Had Available a Fair Stretch of Land Surrounding the Library. This, with Its Trees and Walks, Adds to the Impressiveness and Attractiveness of the Building. Left: One of the Quite Helpful Road Signs Now being Placed along Its Main Highways by the State of Wisconsin. The Name of the Town is Painted in Large Letters, While Beneath is Given the Official Population

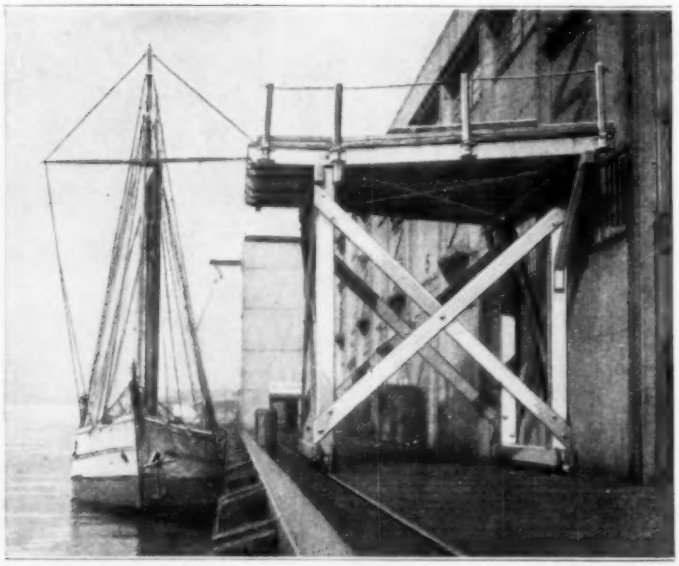


A Motor Coffee Wagon, Equipped with Three Five-Gallon Heat-Retaining Cans for Coffee, One Five-Gallon Can for Soup, and Carrying Sandwiches and the Necessary Cups and Other Utensils, is Maintained by the Fire Department of Baltimore for Use When the Men are Fighting Stubborn Fires

AND ENJOYMENT OF VISITORS AND RESIDENTS

The Building Above, Standing on the Ground upon Which the Battle of Atlanta was Fought, was Built to Exhibit a 400 by 50-Foot Painting That Tells the Story of the Battle. The Giant Canvas is Draped around the Wall of a Circular Room, and There Are Over 1,000 Figures in It. From an Observation Platform in the Center, the Visitor Sees the Battle Scene Presented with Such Intense Reality That He might Easily Imagine Himself Witnessing the Fighting. Right: One of the Life-Size Statues of a University Student, Which will Guide Tour ists to the University of California, at Berkeley

This One-Man, Double-Deck Bus, Which Operates in New York, is Fitted with a Periscope to Enable the Operator to Observe the Passengers on the Upper Deck, and with an Annunciator Megaphone Used in Announcing the Various Stops



One of the Traveling High-Leg Platforms Adopted by the Port Authorities at Seattle, for Loading from the Second Story of Warehouses into Ships

HIGH-LEG PLATFORM AIDS LOADING

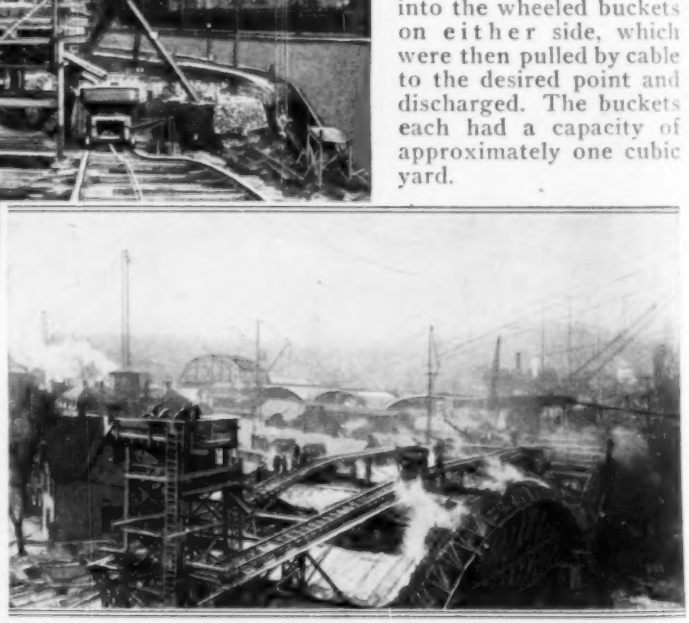
The loading of ships has been greatly facilitated at the port of Seattle, by movable platforms which the port commission has built. The platform is made to register with the floor of the second story of the storage shed, by means of legs carried on wheels that run along the wharf. The outside wheels are double-flanged and run on a steel rail.

¶ The electrification of all railways is being considered by the French government.

DISTRIBUTE BRIDGE CONCRETE IN UNUSUAL WAY

Tower at One End of the Bethlehem Bridge: After being Carried to the Top, the Concrete was Fed into the Buckets on Either Side

A little-used method of distributing concrete was employed in the construction of the arches of the Hill-to-Hill bridge at Bethlehem, Pa. At one end, a tower was built from which tracks were laid on two trestles spanning the arches. The concrete was brought from the mixers in large dump-bottom buckets, hoisted to the top of the tower, and emptied into a hopper. The hopper in turn fed the material into the wheeled buckets on either side, which were then pulled by cable to the desired point and discharged. The buckets each had a capacity of approximately one cubic yard.



From the Tower, the Concrete-Filled Buckets were Hauled by Cable Out on Trestles Spanning the Arches, and Then Dumped at the Desired Points. The Bridge is to be Called the "Hill-to-Hill Bridge"

CONVENTION TO BE HELD IN DEEP SALT MINE

The state convention of the Kansas Knights of Pythias, which will be held next fall at Lyons, can claim two distinctions: It will be the largest lodge meeting ever held in a deep mine and also the only one ever held in a rock-salt mine.

The vast gallery cut in solid rock salt, in which the air is perfectly pure and there is no moisture, will be turned into a veritable palace of the Arabian nights. The walls of glittering salt will reflect the brilliancy of hundreds of electric lights. The roof is upheld by huge crystalline pillars. The floor of pure salt is polished until it is as smooth as a lake of ice. Music will be furnished for dancing merrymakers after they have disposed of the affairs of business.

This mine goes over 1,000 feet straight down into a vein of rock salt 400 feet thick. It is reached by two elevators controlled by an engine housed in a building above the ground.

The meeting is scheduled for Oct. 16-17, 1923, and probably 2,000 delegates from all parts of the state will be entertained in this unusual setting, as the novelty of the affair is expected to bring out a large number of interested participants.

SKIING TAUGHT IN INDOOR SCHOOLS IN NORWAY

"Ski-running," says a famous British figure skater, "is not for the timid, but it is the king of winter sports." In recent years the popularity of this difficult art has increased rapidly, and in the Scandinavian countries, the original home of the sport, indoor training schools are now being established for teaching the elements of the sport. A wooden bridge is used for this purpose, having inclined approaches, and enabling beginners to practice balancing and acquire the necessary confidence when negotiating the slopes.

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An Indoor Skiing School for Norwegian Girl Beginners: A Portion of a Gymnasium has been Converted for Instruction Purposes, and a Wooden Bridge Erected for the Ski Novices to Practice On

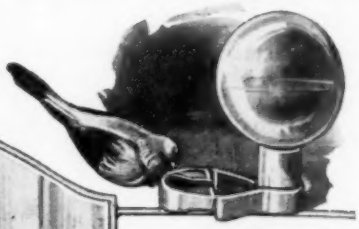
FOULING OF SHIPS' BOTTOMS INFLUENCED BY COLOR

The color of paint on a ship's bottom is an important factor in the amount of fouling that occurs, according to a series of experiments recently completed. The results showed the fouling to be greater on a dark surface than on a light one, the difference between white and black painted surfaces being particularly marked. Barnacles especially seemed averse to light color.

¶Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

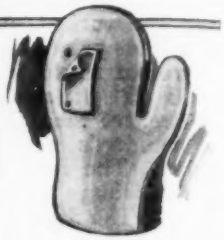
Bill Fold with Stamped Straps, Which Show Each Denomination Separately, Preventing Mistakes



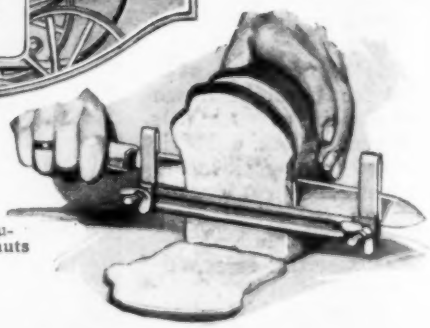
An Air-Tight Water Bottle for the Bird, Insuring a Week's Supply of Fresh Water: The Bird cannot Bathe in It

This Combination Bassinet and Baby Carriage Prevents Damp or Chilly Drafts from Reaching the Child; and Baby can be Carried Indoors or Out without Excessive Handling

A Parrot, Attractively Stained in Natural Colors, and Having a Small Interior Tubular Lamp



Rubber Work Mitten, Fitted with a Flap for Ventilation Purposes



Adjustable Bread Slicer Which can be Attached to Any Knife, for Cutting Slices of Uniform Thickness: The Thickness of the Slice can be Regulated by the Wingnuts on Each End

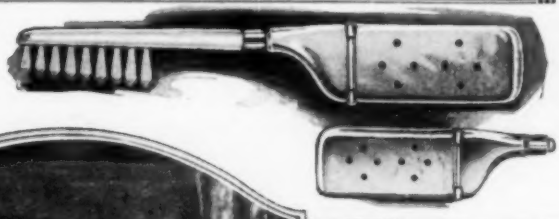
This Is the Perfect Butler, Who Has All Things to Hand for His Master's Service. He is Electrically Connected, and Holds a Reading Light Aloft and an Ash Tray, in One Hand, While the Other Balances a Glass and Tray, as Well as a Box of Matches in Case the Electric Cigar Lighter does Not Work

Self-Draining Laundry Tubs Which Take the Backache Out of Washday: The Tubs Tilt Forward, and are Telescoped with the Frame When Not in Use

Anyone wishing further information on devices described in the editorial pages can

INTENDED FOR THE HOME AND ITS MEMBERS

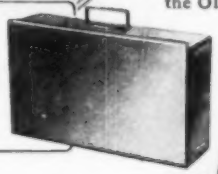
A Combination Cover Clamp and Lifter, Making It Easier to Keep the Lid Closed Air-Tight, or to Lift the Cooker When Hot



This Pocket-Style Toothbrush Is for Travelers and Others. It Folds into Its Case, Which is Perforated for Ventilation

Sanitary Drain Flusher for Attachment to the Kitchen Sink: The Hand Plunger Forces the Dirt Out

A Sanitary and Convenient Kitchen Utensil That Does Away with the Old-Fashioned Sink Broom and Drain Brush



Portable Camp Stove in Which All Parts are Securely Attached to the Case, Even the Legs being Hinged: Right, All Folded Up. Its Weight Is Only 13 Pounds

This Nail Buffer Has No Hard Backing and Conforms Nicely to the Curve of the Nail

A Convenient Set of Three Chairs, Which can be Nested Together, When Not in Use, as Shown at the Right

New Laundry Accessory: A Combination Washboard and Wringer

CHAIN AVERTS EXPLOSIONS IN DRY-CLEANING PLANTS

Fires caused by benzine explosions occur more or less frequently in dry-clean-

An Effective Device for Preventing Explosions in Dry-Cleaning Plants: The Chain Which the Workman is Holding Serves to Ground Static Charges of Electricity

ing establishments, but none has happened in an eastern plant since the adoption of a simple device for grounding static electricity when a workman is reaching into a washing machine. When doing this, the workman merely holds a chain which is connected to a water pipe, thereby grounding himself and conveying the static electricity to the ground. It is well known that substances like cotton, linen, silk, and especially unwashed or undyed wool or textiles, become more or less electrified when rubbed. When this is done in a bath of benzine, the latter also becomes electrified, but with an opposite charge, and a spark may form at any time, exploding the fumes from the very volatile and inflammable fluid. This condition is the most frequent cause of explosions and fires in dry-cleaning works.

The best snow men modeled in the various playgrounds by school children of Jersey City, N. J., were awarded prizes in a contest held this winter by an official of that city.

SUNDAY CLUB OF CHICAGO BROADCASTS PROGRAMS

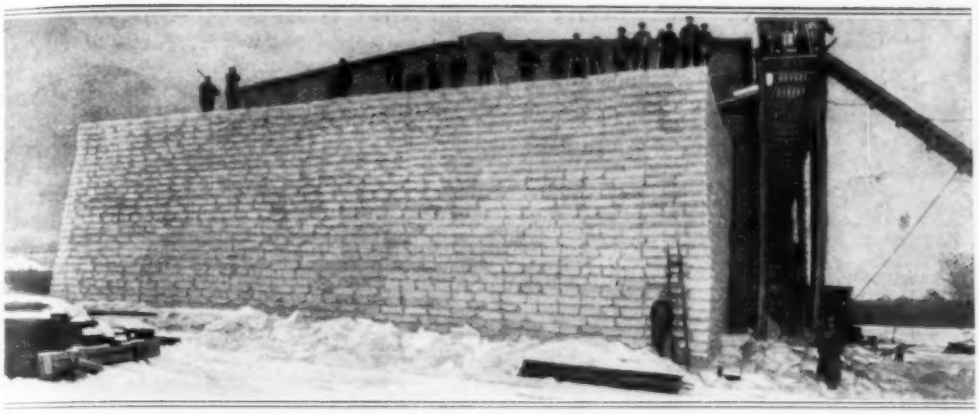
The Chicago Sunday Evening Club, a nationally known, nonsectarian organization founded by prominent Chicagoans to promote the moral and religious welfare of the city, and meeting for years at Orchestra Hall, on Michigan Ave., has lately been broadcasting its programs. These programs are somewhat similar to those given at the Town Hall, New York City, and include talks by men well known throughout the country. Henry Van Dyke, Charles Hughes, William H. Taft, and the late Lyman Abbott are among those who have spoken at the club during recent years.

ALL-STEEL STEPLADDER HAS MANY ADVANTAGES

An interesting improvement over the bulky, heavy stepladders of everyday use is a new type, of all-steel construction, now being marketed. In addition to its light weight and space-saving qualities, the ladder embodies many safety features of unusual interest. Nonslipping steps have been provided as well as guard rails, and springs and other weak features have been eliminated. The ladder is mounted

A Lightweight, Space-Saving Stepladder: Note the Locked Construction of the Sliding Hinges to Prevent Premature Closing

on casters, and is also equipped with overhang hooks at its upper end to prevent slipping.



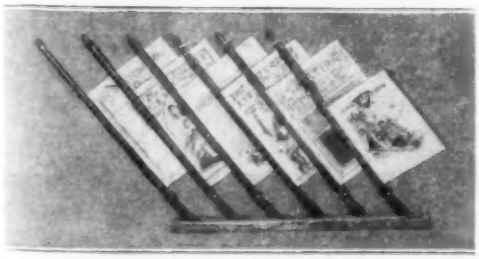
Building an Ice House around a Stack, 31 Feet High, with 10 Feet More to Go: A Prolonged Cold Spell Necessitated Storing This 3,000-Ton Pile Out in the Open, and the House was Subsequently Built over and around It

USUAL ICE-STORAGE PRACTICE IS REVERSED

A prolonged period of sub-zero weather found one eastern ice company so swamped with the large harvest as to necessitate unusual means of storing the unexpected excess. Its storehouses being already filled, the company stacked more than 3,000 tons of ice out in the open, in a space immediately adjoining one of its storage houses, and then proceeded to build a shelter about the huge ice pile. The ice was stacked in 12-inch layers, and was piled up to a total height of 41 feet before being roofed. This reversal of usual storage methods was also accompanied by a considerable saving in loading cost, due to the plentiful light and also to the freedom of movement possible when working in the open.

BAR HOLDING MAGAZINE FILES FITS ON NARROW LEDGE

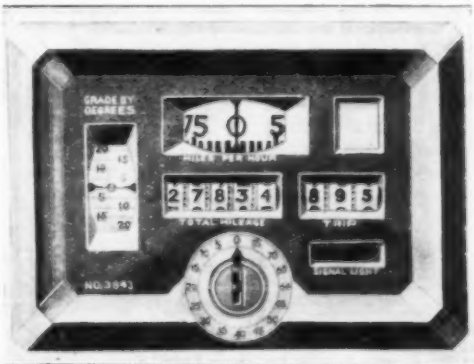
To save space in libraries, in the office, or in the home, an inventor has designed a rack for holding newspapers or magazines which can be put in place on the window sill, or any other narrow ledge having a vertical background. The device consists of a wooden bar, provided with slanting holders of the ordinary type to receive the ends of the files.



Wooden Bar with Slanting Holders for Magazines: It can be Placed on a Window Sill or Any Other Suitable Ledge

SPEEDOMETER SIGNAL FLASHES DANGER LIGHT

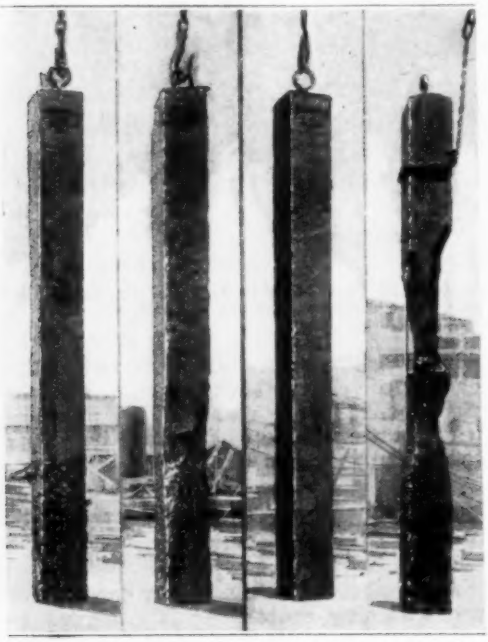
An important automobile accessory for use with any motor car is designed to reduce the hazards of speeding by flashing a signal light on the dial board as soon as the car exceeds any predetermined speed limit. The instrument may also be adjusted to flash at a speed slightly under the desired limit, and then to cut out the ignition automatically when the limit is reached. In addition it has the usual dials for recording speed, trip mileage, and total mileage, and an indicator which records the degree of inclination when the car runs up or down a grade.



The Signal-Flashing Speed Recorder: Speed Limits may be Quickly Set with a Turn of a Key, Which is Also Used to Lock the Ignition

TEST ACTION OF SALT WATER ON CONCRETE PIERS

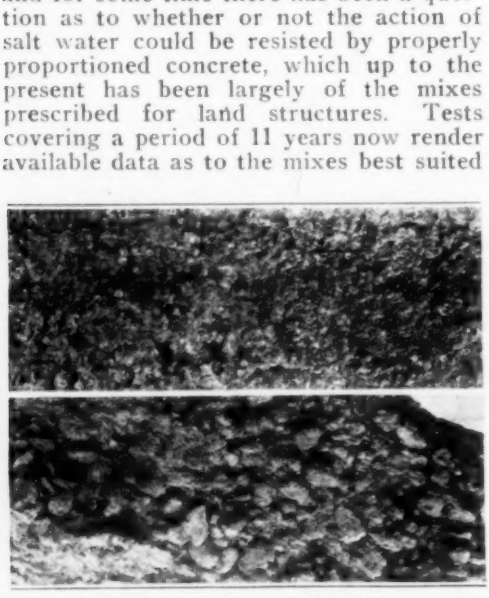
It is well known that sea water has a deteriorating effect on concrete masonry



Left: Concrete Piles of a Rich and Lean Mix after Four Years in Sea Water. Right: Same Two Piles after 12 Years' Immersion

and for some time there has been a question as to whether or not the action of salt water could be resisted by properly proportioned concrete, which up to the present has been largely of the mixes prescribed for land structures. Tests covering a period of 11 years now render available data as to the mixes best suited for concrete work that will be subject to the action of sea water.

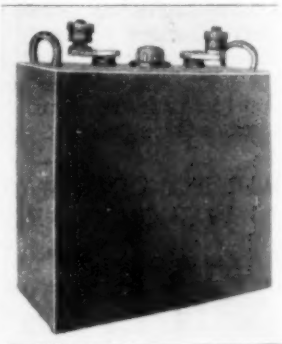
Twenty-four specimens of different mixes were made up at the navy yard at Charlestown,, Mass., and suspended from a cap log of a wharf. The length of the test piles was 16 feet, which was sufficient to keep the bottom always immersed while the top was always above the water level. The specimens were permitted to remain in the water for over four years, when they were all taken out for inspection, at which time all were photographed and indications of deterioration recorded. After a seven-year period, the piles were again lifted. At this inspection it was found that the heavy growth of barnacles which had accumulated on the piles at the first inspection, had been destroyed by crude oil floating on the water. Four piles made of a dense mixture, comparatively high in cement, showed little effect of the nearly 12 years' immersion. The effect was increasingly marked on more porous piles, and on those made from mixtures in which the amount of cement used was relatively small.



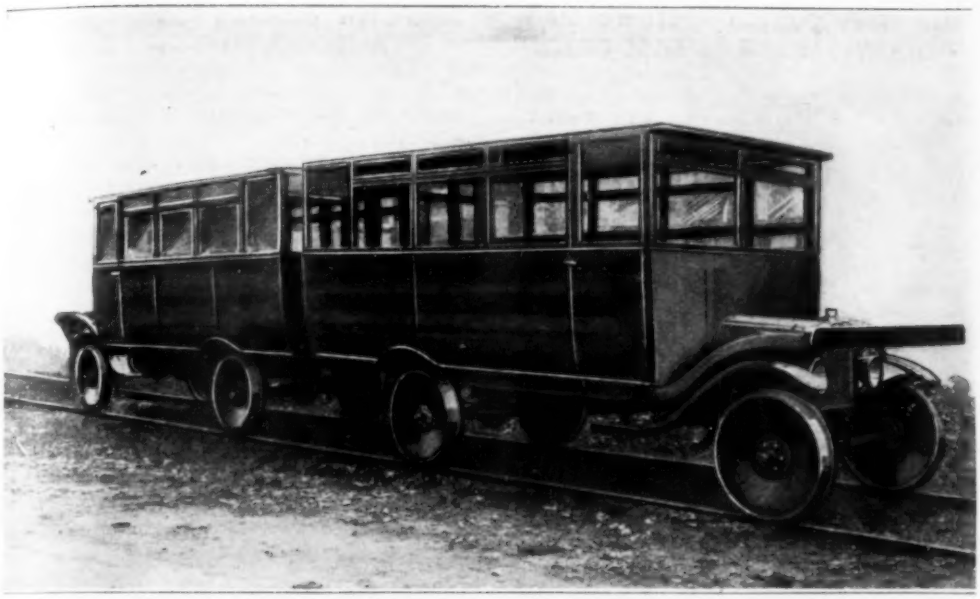
Above: Magnified Surface of Dense-Concrete Pile after Immersion in Sea Water. Below: Comparative View of Pile Made from Lean Concrete

NEW STORAGE BATTERY FOR RADIO TUBES

A new storage battery, now on the market, has been designed with a view to the requirements of radio tubes that have been using dry cells. It is an 11-plate battery constructed from standard battery parts and has an 80-ampere-hour rating at 2 volts. When used in connection with radio tubes drawing ¼ ampere, the battery will give approximately 320 hours' service.



¶About 149 pounds of meat per capita were consumed in the United States during 1922, announces the Department of Agriculture. Pork and beef ranked highest in the kind of meat purchased. The total consumption was about 16,000,000,000 pounds, a new record for this country.



Gasoline Rail Cars Operated in Tandem by Placing Back to Back Two Automobile Chassis, on Which are Fitted Passenger-Carrying Bodies: A Center Buffer and Draw Pin Combined is Used, and a Sliding Door is Provided at the Rear of Each Body

TANDEM AUTO CHASSIS USED FOR RAILWAY COACHES

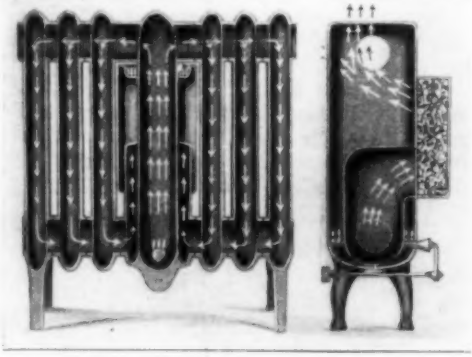
One of the most interesting adaptations of the gasoline automobile to rail service, is a tandem arrangement of two automobile chassis that recently appeared in Europe. The autos are fitted with passenger bodies, the usual steering gear dismantled, and flanged wheels fitted to a solid axle. The cars are coupled and run back to back, for which purpose a center buffer and draw pin are provided, and a sliding door at the rear of each body permits ready access from one to the other. They maintain a good average speed, the gears of the rear car being in neutral, and are said to run 15 miles to the gallon of gasoline with the vehicles fully loaded.

PLAN OCEAN TRAFFIC LANES FOR PACIFIC SHIPS

Transpacific shipping has increased to such an extent that, in the interests of safety, the establishment of definite routes for the masters of vessels to follow, is being considered. To meet this condition the Hydrographic Office of the U. S. Navy, after careful study, recommends lanes for eastbound and westbound ships to take throughout the year. In contrast to this, ships sailing the Atlantic, where similar practice has been followed for years, must shift to a more southerly course during the iceberg season.

GAS RADIATOR MADE FUMELESS BY MEANS OF GAS MASK

A gas radiator for heating purposes, which has just appeared on the market, embodies various hygienic features of considerable interest. It is designed to be fumeless, and radiates heat containing sufficient moisture to provide the necessary humidity. A cast-iron retort, or gas mask, contains a patented compound which absorbs all the impurities of the



A Gas Radiator Designed to Promote Health: Cold Air is Drawn from the Floor, Heated, and Filtered through the Gas Mask before Entering the Room

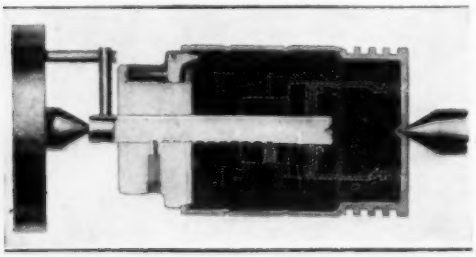
air as well as those resulting from the combustion. No vent or chimney of any kind is required when this type of radiator is used.

CANDY, NUTS, OR SIRUP MAY GO WITH ICE-CREAM CONE

The addition of a flavored sirup, of fruit, of nut meats, or of candy to an ice-cream cone, will be possible with a new invention. After the cone and its ball of ice cream have been prepared, a little container of pastry or confectionery may be pressed into the ice cream to hold the sirup or other delicacy. A small conical projection on the container will hold it in place, and the container and its contents may be eaten with the ice cream and the cone.

TURNING AND GRINDING ARBOR FITS ALL PISTONS

A turning and grinding arbor that fits all the pistons in a line of various lengths and diameters, is now on the market. It maintains the same center distances in the lathe or grinder, and enables the operator to finish the different-sized pistons without changing the set-up. It consists of a steel arbor with notched holes along one side that receive the end of the set-screws of the different adapters which grip the open end of the pistons. The piston is slotted to receive the retaining finger driver on the adapter.



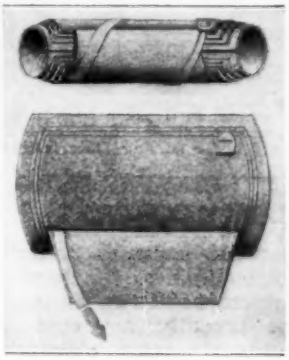
Arbor That Permits Pistons of Various Lengths and Diameters to be Finished without Changing the Set-Up: It Is the Notches along One Side That Makes This Possible

AUTOMATIC DEVICE REGISTERS AUTOS VISITING PARK

A new device which automatically registers the automobiles that visit the Cascade National Forests, has been installed on the entrance road. It consists of a number of steel springs placed in a wooden culvert over which the autos have to pass. Each time an automobile goes over the culvert, the springs undergo a slight depression which operates the recorder.

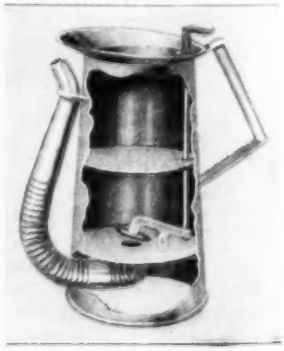
EMERGENCY REPAIR DEVICE USED ON INNER TUBE

A recently patented device for making emergency repairs to pneumatic tires in the case of a blow-out or weakening of the shoe, due to stone bruise, rim cuts, or wear, consists of a boot that is wrapped around the inner tube. An extension flap, and a strap that encircles the whole device when attached to the tube, prevent creeping and injury to the inner tube.



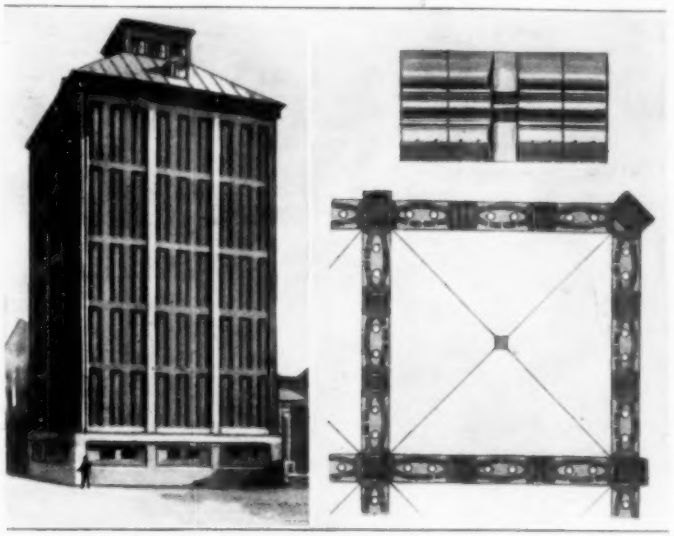
OILCAN HAS LARGE STRAINER AND CONTROL VALVE

A liquid measure, for the use of motor-car owners and garage men, has a horizontal strainer fixed at the middle. In addition it is equipped with a valve at the bottom, controlling the flow of oil, which is manipulated by a thumb lever at the top of the can. The spout is flexible so that the can actually serves as a funnel.

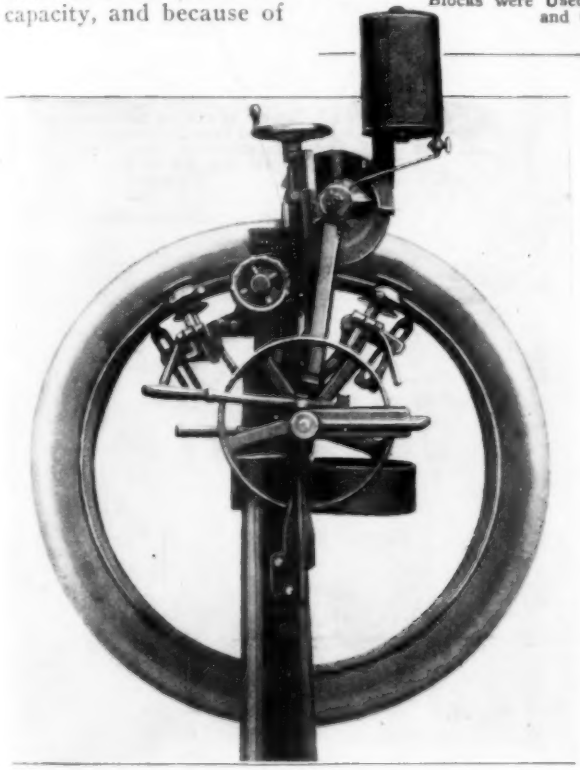


STANDARD BLOCKS SIMPLIFY SILO CONSTRUCTION

An unusual type of concrete silo has been erected in Germany, in which blocks of the same shape and size have been used throughout to form the cell walls. The cells of the silo are square, each having three bays to the side, and the unit of construction consists of two arched pieces which flank each other to form one bay in the wall. Concrete is poured between the adjacent ends of the arched bays, forming heavy piers which run down to the foundation floor and support the structure. The arched blocks are also provided with air holes, permitting circulation between the hollow shells that form the wall. The new silo is of 2,000 tons' capacity, and because of its unusual design was built at a great saving both in cost and in time.



A Concrete Silo of Hollow-Sidewall Construction: Standardized Arch Blocks were Used, Avoiding Extensive Shuttering, and Cutting Down Costs



A Tire Skiver, or Slicer, Set Up for Operation: The Machine can be Adjusted to Skive All Sizes and Styles of Tires, Leaving a Feather-Edge Which Facilitates Insertion into Another Tire of the Same Diameter

TIRE SLICER FITS WORN TIRES FOR REUSE

A new use has been found for tire casings which have become worn or injured in travel, whereby they add greatly to the toughness and strength of other tires, and incidentally afford better protection to the inner tubes. A tire skiver, or slicer, is the means employed for cutting the beads from the old casing, leaving a feather-edge which facilitates its insertion into another casing of the same size. The advantage of this double lining to the inner tube is reflected in the superior tire economy which results.

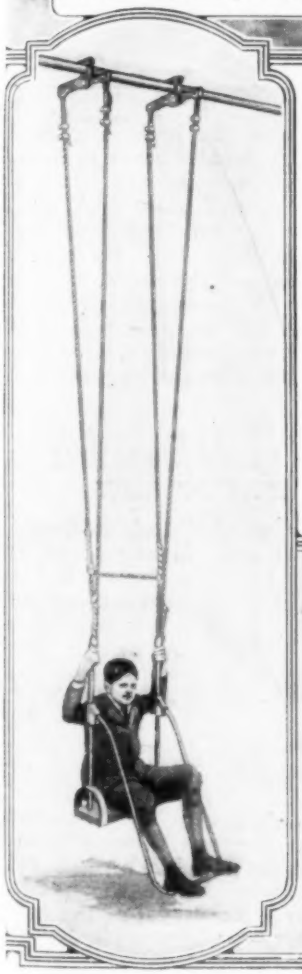
The ever-increasing number of Chicago's broadcasting stations has compelled the designation of a "silent night" for the benefit of amateurs. At seven o'clock every Monday night these stations of the city will close, and for five hours the fans will have an opportunity to "fish" for distant stations without fear of local interruption.

Pushball was Played on Ice Skates by Students of the Lane Technical High School in Chicago Last Winter. There Were 50 Men on Each Team, and the Game Was Exciting to Watch. The Side Getting the Ball down the Length of the Field First Won. No Interscholastic Meets were Held

Tablet Donated by Alumni of Mid-Western Military Academy, Marking Spot Where They Walked around and around Tree as Punishment for Misbehavior: This Means of Disciplining is No Longer Followed

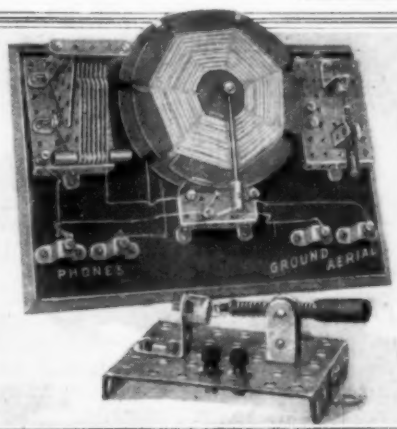
At the Woodward High School in Cincinnati, the Students Make Phonograph Cabinets, Install the Motors, and Then Send the Finished Product to Public Schools throughout the City, Where They are Used to Furnish Music for the Gymnasium Classes and for Other Purposes. Incidentally, the Plan Saves the City Money

A Regular Course in Tractor Work has been Started at the Texas Agricultural and Mechanical College Because It is Said That a Great Many of the Ranches in Texas are Rapidly being Turned into Farms, and Students, Intending to Keep Abreast of the Times, must Know How to Run and Repair Farm Machinery



To the Left Is a Picture of a Swing, Which has been Especially Designed as a Means of Exercise. The Rider Sits as Usual and Starts the Motion by Pulling on Two Sliding Hand Grips, and Pushing upon a Steel Footrest

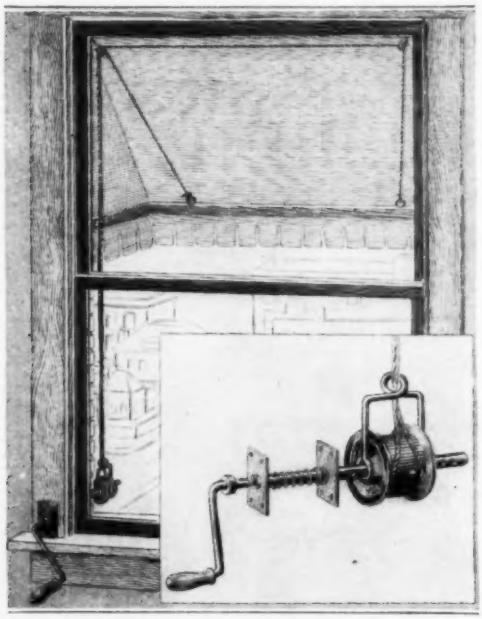
"Stubby," Former Mascot of the 26th Division, Decorated by President Harding, General Pershing, General Edwards, and Foreign Nations, "Invited" to Washington to Assist in a Movement for Furthering the Soldiers' Bonus



Special Radio Parts are being Supplied by One of the Companies Manufacturing Mechanical Building Sets, So That Boys Having Its Standard Equipment may Purchase the Necessary Radio Parts, and Then Construct a Set of Their Own. In Addition the Company Supplies Instructions and Suggestions for Improvements

WINDOW AWNINGS ADJUSTED FROM INSIDE OF HOUSE

To avoid the trouble of leaning out of a window to raise or lower an awning, a simple device is now available by

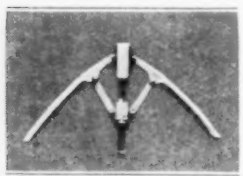


Device for Raising and Lowering Window Awnings from Inside in Place: The Inset Shows the Construction of the Device in Detail

which the awning may be adjusted from the inside. The awning is hung and roped as for hand operation. The shaft of the device passes through the window frame, terminating outside with a pulley which winds up or unwinds the rope to raise or lower the awning. Inside of the window the shaft end is held in place by a plate attached to the frame, and carries a socket into which a crank fits.

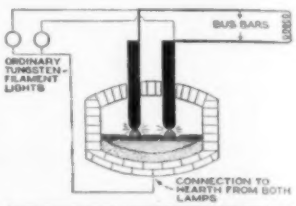
RIVET AND BOLT EXTRACTOR EXERTS HEAVY PRESSURE

The removal of rusty nails, pins, or rivets from machinery is greatly simplified by the aid of a small tool which operates on the jack principle. A threaded bolt forms the jacking member of this device, and its end is brought up snug against the piece to be extracted. Twin levers, linked to a threaded nut on the central bolt, grip the piece when the nut is turned, the resulting leverage causing a combined gripping and pulling effect on the imbedded piece, loosening it in proportion to the amount turned.



PILOT LIGHTS AID CONTROL OF ELECTRIC FURNACE

A simple method employed to improve the regulation of electrodes in an arc furnace of the Heroult type, is by means of pilot-light control. In the case of a single-phase furnace, two 40-watt tungsten-filament lamps, which will glow at 15 volts and stand surges of 125 volts, can be used, while three lamps will serve for three-phase. The lamps are connected in series across the bus bars and provided with a common connection to the bath, a connection to the hearth usually being sufficient for the latter. When no arc is established, both lights will glow with equal brilliancy. With current flowing through the furnace, the lights will be equally bright if the arcs are the same, but the slightest change in the length or resistance of one arc will be indicated by its lamp. If one electrode should touch the bath, its lamp would instantly cease glowing.



WEEDER IS ADJUSTABLE TO WIDTH OF ROW

An adjustable weeder and cultivator, recently brought out, is composed of teeth fastened to an expanding frame into which the handle fits. It may be set to cultivate rows up to 14 inches in width. Owing to the V-shape of the cutting blades, the cut weeds are forced inward to the middle of the row, or by the removal of the center tooth, the row may be straddled. The tool is light and easily handled.

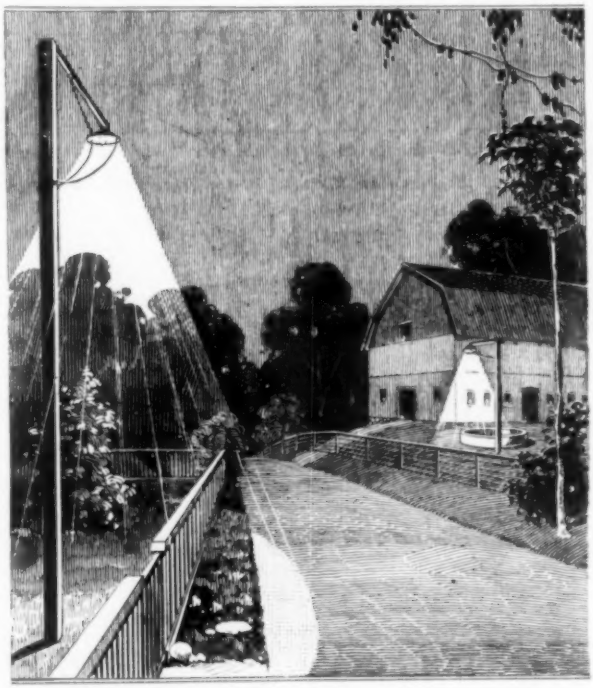
Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Homemade Electric Light for the Farmyard

By J. R. KOONTZ

FARM-LIGHTING plants are now universally used in the country, and, in many communities, the city lines are extended to serve the farmers for miles throughout the surrounding territory. In addition to the lights in the house and outbuildings, many farmers would like to install a few yard lights, were it not for the expense involved.

This was the case on our farm, until we determined to make the lights ourselves; one of the resulting lights is shown in the accompanying photograph, and, as each one costs only about $1.30 for material, we made three or four, where we would have been obliged to use only one, had it been purchased.

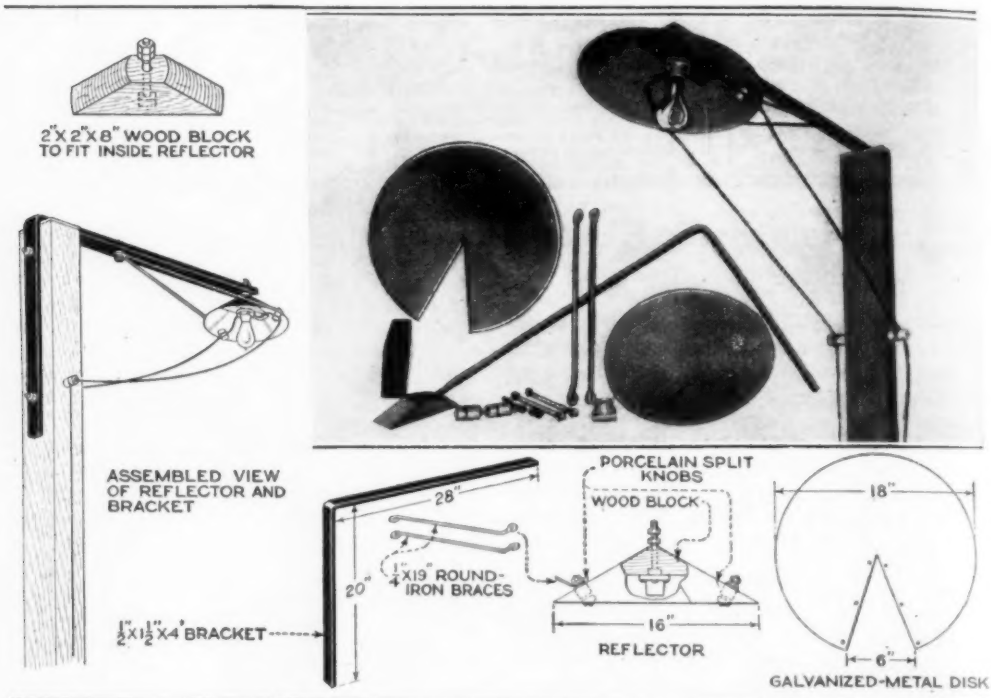


Yard Lights are Easily Made in Any Farm Workshop, and will Add Much to the Comfort and Convenience of Work around the Yard at Night

A 4-ft. piece of ½ by 1½-in. iron is bent at right angles, as shown in detail drawing, one end being 20 in. long, the other 28 in. Drill two holes in the 20-in. leg, to fit the ⅜-in. bolts used to fasten the bracket to the post. Two similar holes are also drilled in the other leg, one 2 in. from the end, for the bolt that holds the reflector, the other 18 in. from the end, for the braces.

A galvanized-iron sheet, 18 in. square, is cut in the form of a circle, and a V-shaped cut made in it, as shown, the cut being 6 in. wide at the edge, and carried to the center. The disk is then bent or rolled to a conical shape, and the edges, which should overlap about 1 in., riveted and soldered. A ⅜-in. hole is punched in the center. A block of cypress, or other wood that will not rot when exposed to weather, is shaped, as shown, to fit the reflector, and drilled for a ⅜-in. bolt, the head of which should be sunk into the wood; a nut locks the block in place, a leather washer being used between nut and reflector, to prevent water from soaking into it. The reflector is then bolted to the bracket with a nut and washer.

A 4-ft. length of ¼-in. round iron is cut in two, and two braces, with an eye formed on each end, made as indicated. These are bolted loosely to the bracket, as shown in the assembled view, and the places where the outer eyes rest on the reflector are marked. Holes to fit stove bolts are punched at the marked spots, and the porcelain knobs assembled, passing the stove bolts through the knobs, reflector, and braces, and using a leather washer between each knob and the reflector, and metal washers



The Photos Show All the Material Necessary to Construct the Yard Light, Together with a Completed Fixture. The Drawings Show Details of the Various Parts Used, and the Method of Assembling Them. The Cost of the Purchased Material for the Fixture Shown Was Only $1.30

under the nuts. Do not draw the nuts tight until the wires are in place.

The lamp receptacle is now screwed in the center of the wooden block, the wires attached to it, and led through the slots in the knobs, and the knobs and braces are drawn up tight. A coat of good paint or enamel completes the job, except for bolting the bracket to the post, and leading the wiring, through knobs screwed to the post, to the switchboard.

The necessary materials for each light, with the prices paid for them, are:

4 ft. of ½ by 1½-in. flat iron	$ .40
1 piece of 18 by 18-in. galvanized-iron sheet	.35
4 ⅜-in. bolts	.10
4 ft. of ¼-in. round iron	.10
1 porcelain receptacle	.15
4 split-knob insulators	.10
2 stove bolts and 2 wood screws	.10
Total	$1.30

These prices will vary a little in different localities, but not much. They do not, of course, include the pole, but this may usually be picked up around the farm, or the lights may be bolted to the buildings, if found more convenient, and the poles thus eliminated.

Cleaning Greasy Clutches

One of our heavy derricks, which was of the cone-clutch type, with wooden friction blocks, caused considerable trouble by the friction blocks not taking hold when the levers were operated, due to oil that had saturated the surface of the blocks. This trouble made frequent renewals of the blocks necessary.

It happened, one day, that a lighted match was carelessly thrown into the machine, with the result that the oil quickly ignited. To extinguish the flame, the operator used the fire extinguisher, which was filled with a solution of carbon tetrachloride. In doing this, the solution was also squirted over the friction blocks. When the machine was again used, the friction blocks took hold as if new, the solution having dissolved the oil on their faces. A large can of the solution was then obtained, and used to clean the friction blocks whenever necessary.

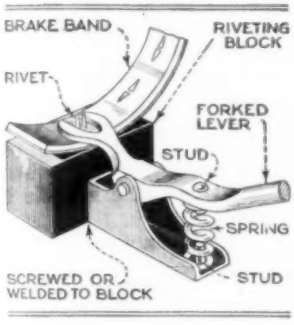
The solution has also given good results in cleaning greasy automobile clutches and oily brake bands. It is much better than gasoline or kerosene, and is,

of course, safer than these, because it is not inflammable. It will not injure wood, leather, or fabric. Although the cost of carbon tetrachloride is greater than that of gasoline and kerosene, its superior cleansing qualities make up for this difference. It evaporates rapidly, and therefore should be kept in a closed can.

Care should be taken not to get the solution on the skin, as it is very irritating, nor in the eyes, which it will cause to smart.—A. S. Jamieson, Springfield, Massachusetts.

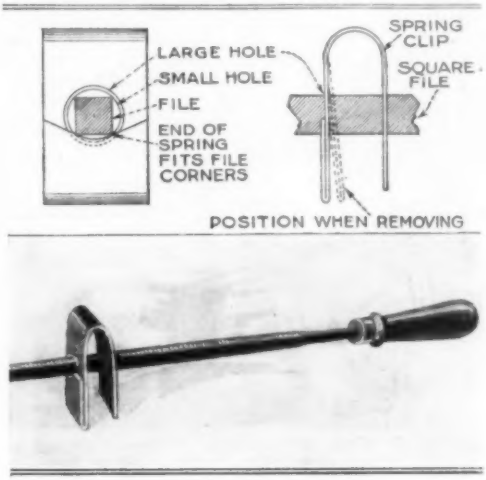
Fixture for Relining Brake Bands

The fixture illustrated has been found to facilitate greatly the relining of brake bands. It consists of a steel riveting block to which a lever bracket is screwed or welded, as shown. In this bracket, the lever, the construction of which is clearly shown, pivots. A strong coil spring, held in place by two studs, presses the forked end of the lever tightly on the face of the riveting block, so that when the brake band is inserted between the two, it is held securely. The rivet is pushed through the hole in the band, which is then placed between the riveting block and lever, the rivet being under the opening in the jaw. The pressure of the lever forces the rivet through the lining; the ends can be bent over in the usual way by means of the ball end of a light hammer.



Finger Protector for Files

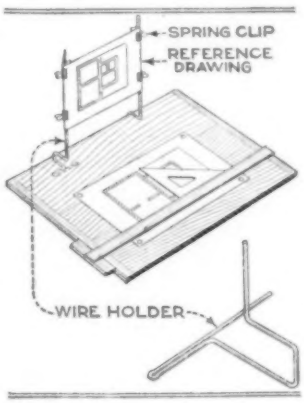
When squaring holes and slots with a square file, the fingers are likely to be pinched between the file and the work, on the backward stroke. This particular cause of minor shop injuries can easily be eliminated by using a finger protector on the file. Some use a piece of leather for this purpose, but this is not satisfactory on a lengthy job, as it soon works loose, and, if pushed on tightly, cannot be removed as quickly as it might be. The spring-steel clip shown has two holes in line, one fitting the file neatly and the other a little larger. On the same side as the larger hole, the spring is doubled over, and the end ground concave, so as to bear on the file corners. This concave end holds the clip in place on the file. To put on or remove it, the ends of the clip are squeezed together slightly so that the concave end clears the file corners and allows the clip to slide easily.



Above: Details of Spring Clip That Prevents the Workman's Fingers from being Pinched between Work and File. Below: Clip in Place on File

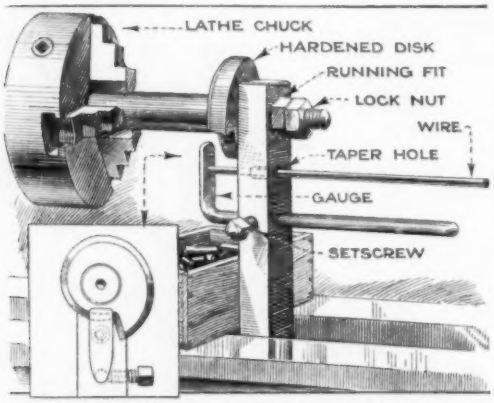
Holder for Reference Drawings

A draftsman can keep his reference drawing before him and work with ease if he uses the wire holders shown in the illustration, instead of keeping the reference drawing on his board, where it is in the way. The holders are made of No. 4 galvanized-iron wire, bent to the shape indicated, so that they will clamp over the edge of the drawing board. They can be set in various positions to suit any size of drawing. The edges of the drawing or print are folded around the holders and attached to them by means of spring paper clips, four usually being required.



Wire-Cutting Fixture

In a machine shop where a certain job called for the production of a great number of pins of various sizes, ranging from ¼ in. to 3 in. in length, and from 1/16 in.



An Easily Made Wire-Cutting Fixture Arranged on a Lathe: It will Cut Various Sizes of Pins Accurately to Any Length

to 3/16 in. in thickness, an adjustable wire-cutting fixture was arranged on the lathe as indicated. With this fixture it was found possible to cut the pins accurately to any desired length, and at a rate of approximately 100 to 150 per minute.

The body or post of the fixture consists of a hardened and ground 7-in. length of 1-in. square steel, fastened to the lathe bed. Three holes are drilled through the post, as shown; the upper one, which supports the arbor, is reamed to a running fit; the tapered hole below it is for the insertion of the wire, and the lowest hole for holding the gauge. A setscrew is provided to hold the gauge tightly in any position. The arbor is made of mild steel, ¾ in. in diameter and 8 in. long, turned down near one end to 9/16 in. in diameter, wide enough for the cutter; then turned to a ½-in. diameter for a distance equal to the thickness of the fixture body and the width of two lock nuts. The 9/16-in. portion, and the outer end of the ½-in. part, are threaded. The cutter is a hardened-steel disk, shaped as shown, with a 9/16-in. tapped hole in the center. The arbor is held in the lathe chuck, and the fixture assembled as shown. The lathe is run as fast as the wire can be fed by hand, between each "stroke" of the cutter.—H. Mayer, London, Eng.

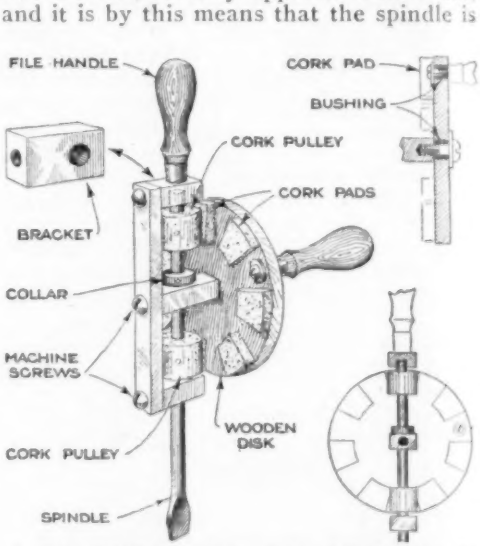
¶For all diameters the transverse pressure on a boiler is double the longitudinal pressure.

A Novel Valve-Grinding Tool

When grinding the valves of an automobile engine, the heads are given a partial revolution in their seats, grinding both valve and seat at the same operation, the usual means of imparting this motion being a screwdriver or a suitable bit held in a brace.

The drawing shows a tool that can be quite easily made, with which the valves may be ground rapidly by a continuous turning motion in one direction only, the tool itself reversing the motion. The frame is made of flat bar steel, with suitable brackets for supporting the vertical spindle and wooden disk, as illustrated. Two cork pulleys are attached to the spindle, and these bear against cork pads attached to the wooden disk. The length of the center bracket should be such that the cork pulleys and pads are compressed slightly when coming into contact with each other.

It will be seen that the number of cork pads on the handwheel is uneven, with no two of them directly opposite each other, and it is by this means that the spindle is



A Valve-Grinding Tool for Internal-Combustion Engines That Imparts the Proper Back-and-Forth Rotation to the Valves While Turning the Handwheel in But One Direction

rotated back and forth while turning the handle in but one direction. The number of pads is immaterial; they may be 3, 5, 7, or more, according to the distance it is desired to rotate the valves, and, of course, the larger and fewer the pads the greater the amount of rotation. Consequently, having an odd number of pads, and no two directly opposite, but one pad can come into contact with any one of the

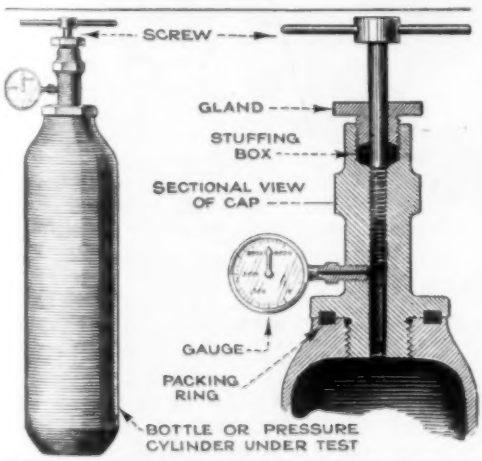
pulleys at a time, and as these contacts alternate between the upper and lower pulleys, the direction of rotation of the spindle is correspondingly reversed.—R. H. Kasper, Philadelphia, Pa.

Simple Attachment for Testing Cylinders

In a shop where large numbers of oxygen cylinders, and similar pressure vessels, were tested daily, a hydraulic test pump was used to pump up the 5,000-lb. pressure required in each cylinder. Due to leakage at the valves and connections, it was found difficult, when the pressure in a cylinder began to drop, to determine whether the cylinder was defective, or the valves and fittings leaking.

After considerable experimenting, the simple method of testing illustrated in the drawing was adopted. A special cylinder cap, made of solid steel, was fitted with an accurately fitting screw, and a pressure gauge. A stuffing box and gland packed the screw, and a packing ring closed the joint between cap and cylinder.

The cylinder is filled with water, and the cap screwed on, the water that occupied the neck filling the hole in the cap. The screw is then screwed down until the required pressure shows on the gauge, and the cylinder allowed to remain under

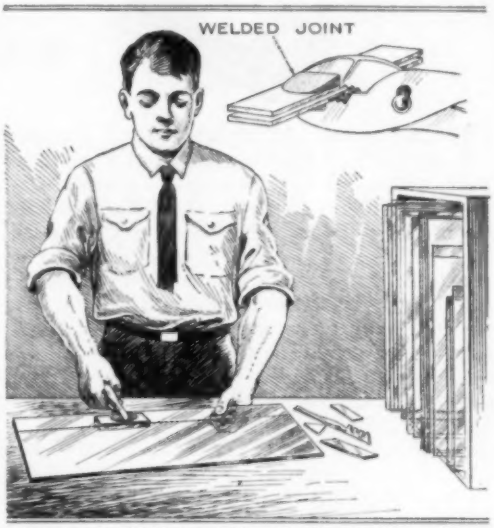


A Simple and Effective Method of Testing Pressure Vessels: Any Leakage That Takes Place While Testing can be Detected Immediately and Stopped

this pressure for five minutes. If no drop in pressure takes place in this time, the cylinder passes inspection. Any slight leakage that may take place through the stuffing box is noticeable at once, and is stopped by screwing down the gland.

Handy Glaziers' Pliers

Glaziers, and other workers in glass, will find the tool illustrated of great assistance in making clean cuts; it is particularly useful when a narrow strip of glass is to be broken from a sheet.

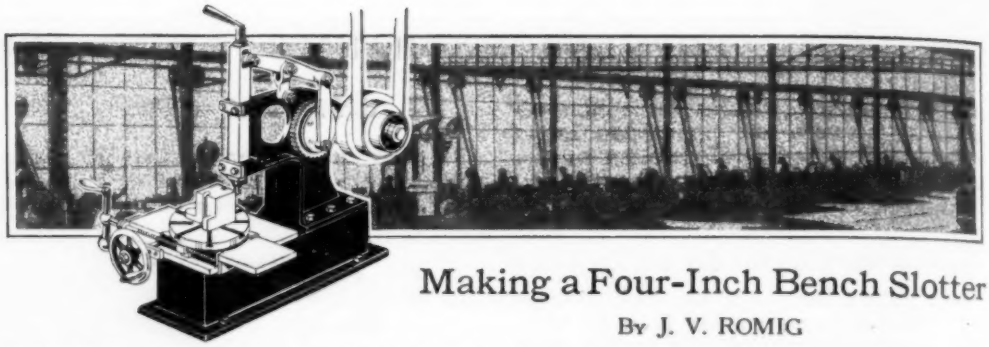


Attachment Welded to Pliers Enables Glazier to Break Off Narrow Strips of Glass with Little Danger of Leaving Rough Edges

The tool consists of a pair of pliers, to the jaws of which strips of flat iron, about 3 in. long, are welded or brazed. These strips must, of course, seat on each other accurately, so that when applied to the glass an even pressure is brought to bear at all points. The increased area covered by the strips eliminates the usual "nicking" of the narrow strip in small pieces, which leaves the work very ragged.

Testing Hair Springs for Magnetism

A very delicate tester for magnetized hair springs, where even the smallest compass at hand is not deflected, is made by pulling a single fiber out of a silk thread, fastening one end to a short piece of soft-iron binding wire, and the other end to the cork of a small vial or bottle, so that, when the cork is in place on the bottle, the wire will be suspended horizontally near its bottom. The thread may be fastened to the cork and wire by means of a drop of shellac. A very slight magnetic influence will be sufficient to influence the light piece of iron wire, whereas it might have absolutely no visible effect on a small compass needle.—Andrew C. Cole, Chicago, Ill.

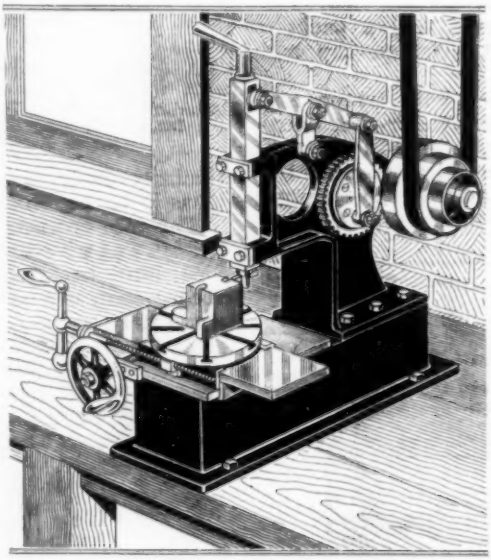


Making a Four-Inch Bench Slotter

By J. V. ROMIG

THE bench slotter described in this article will prove a useful addition to the equipment of the small workshop or mechanical laboratory. It is designed to be made with as little labor and expense as possible, so as to bring it within the reach of those who possess only a lathe and the usual hand tools, and who do not wish to have much of the work, if any, done outside their own shop.

The two straight movements of the slotter table, together with the circular one, permit the production of shapes that cannot easily be machined on the shaper or planer, as, for example, circular arcs and parts, in combination with straight portions. Narrow grooves and keyseats in wheels and levers are also easily cut, with the work lying on the table, while, on the shaper or planer, work of this character would require angle brackets and projecting tools. In addition to these advantages, the layout lines on the work are always in plain view, and working closely to them is rendered much easier than on planer or shaper. The only castings necessary are the bed, frame, table, and cone pulley; the rocker arm, link, and connecting rod may also be made in cast iron, if desired, or built up from cold-rolled steel, or forged.



Perspective View of the Finished Slotter: This will Prove a Valuable Machine in the Small Shop, and One Well Worth the Time Spent in Its Construction

The pattern making involved is simple, and should present no difficulties to those accustomed to the use of woodworking tools. Care should be taken to allow enough stock for shrinkage and machining, and to provide plenty of draft and good fillets in all corners. If in doubt how the pattern should be made, consult the foundry where the pieces are to be cast; many valuable hints can be picked up there, and the advice given may make a big difference in the cost of the parts.

The bed is made of box section, and is shaped or planed true and smooth on its upper face; a rough cut should be taken over the bottom flange also, so that the machine will bed firmly and truly on the top of the bench.

The frame casting, a perspective view of which is shown in Fig. 6, is planed or shaped true on the bottom, and the ram slots shaped out close to size and square with the bed, on all surfaces. The frame is fastened to the bed with $\frac{3}{8}$-in. cap-screws.

The ram is made from a $13\frac{1}{2}$-in. length of $1\frac{1}{4}$-in. cold-rolled steel, carefully straightened and squared, and trued to a surface plate or good straightedge, by scraping. The ram slots are scraped to a good sliding fit on the ram, and the $\frac{3}{8}$ by $2\frac{1}{2}$-in. cold-rolled steel plates, that hold the ram in place, fitted and scraped also. The ram is drilled from one end with a $\frac{5}{8}$-in. drill to a depth of $13\frac{1}{8}$ in., and a $\frac{15}{32}$-in. hole is drilled to meet this hole from the other end. From the end of the latter hole, a $\frac{3}{4}$-in. slot, 2 in. long, is cut through the ram, and the clamp pin, made as shown in the detail in Fig. 4, fitted in place. The slot in the pin is made $\frac{5}{8}$ in. long by $\frac{9}{16}$ in. wide, so as to allow plenty of clearance for the tool-clamp rod.

This rod is turned down from a 15-in.

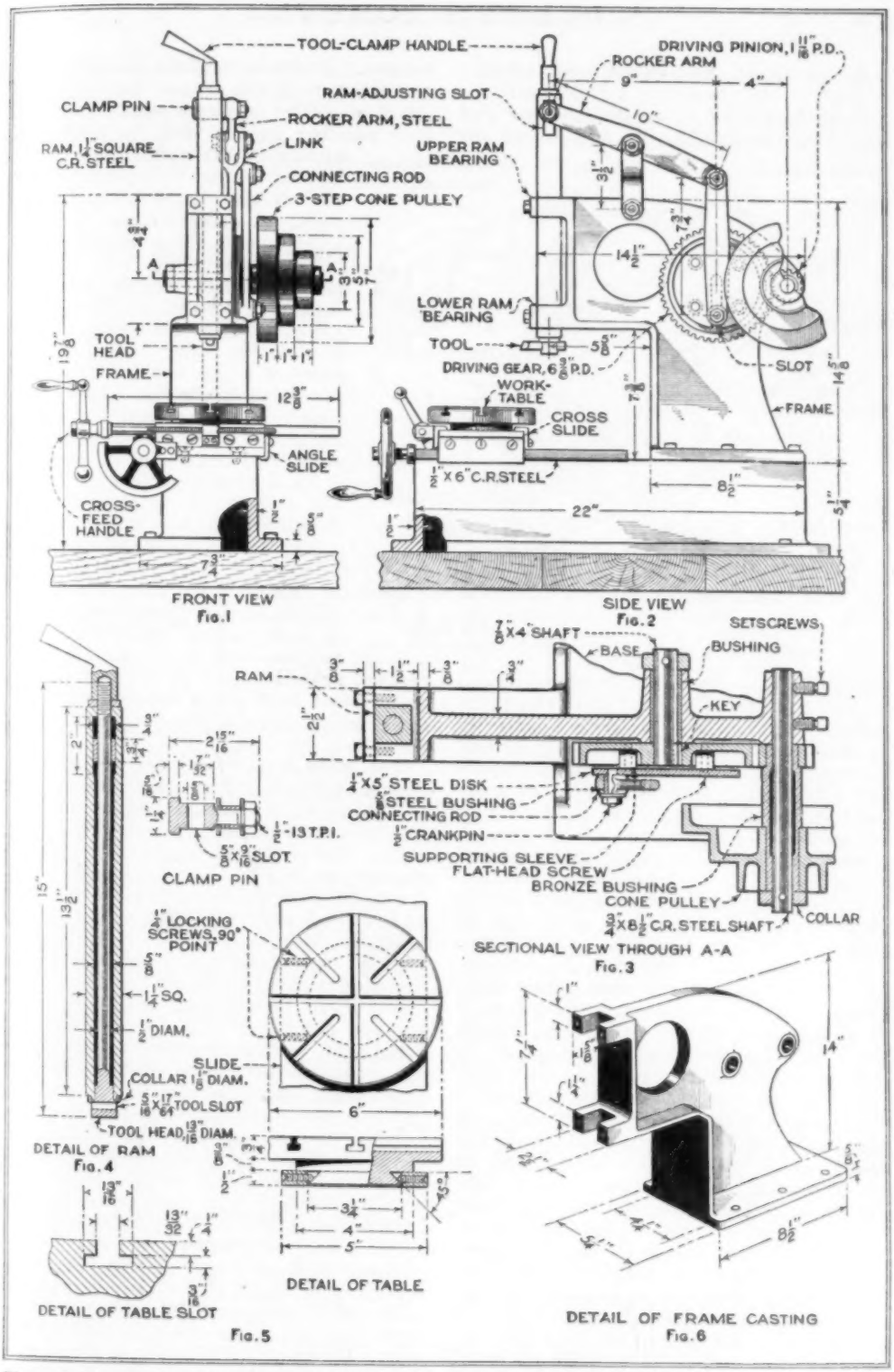


Figure 1, Front Elevation of Completed Machine; Figure 2, Side Elevation; Figure 3, Sectional View, Showing Details of Driving Mechanism; Figure 4, Section of Ram, Detail of Clamp Pin and Tool Head; Figure 5, Plan and Part Section of the Table and Dimensions of Slot; and Figure 6, Perspective View of Frame Casting

length of 7/8-in. cold-rolled steel, or may be built up by threading a 1/2-in. rod into a short length of 7/8-in. stock. One end is turned down to 13/16 in., and slotted for the 1/4-in. tool bits used; a short length is turned down to an easy fit in the 5/8-in. hole in the ram, and the remainder is 1/2 in. in diameter, threaded at the upper end for the tool-clamp handle, which can usually be picked up at a junk store, or made from cold-rolled stock. A 1/8-in. collar, serrated on its lower face, and hardened, is used on the tool head between tool and ram.

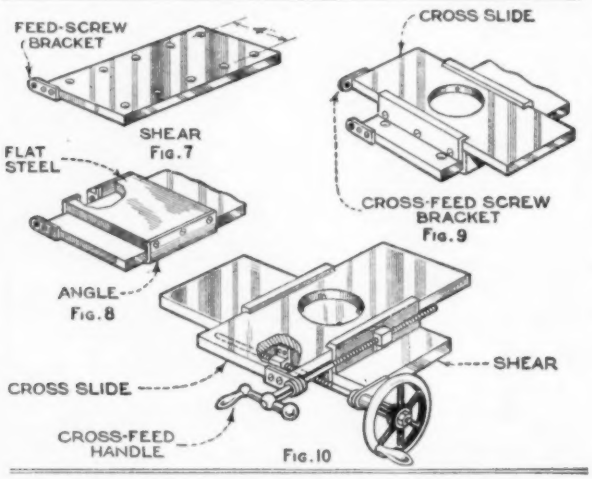


Figure 7, Shear, Which is Fastened to Bed; Figure 8, How Slide is Attached to Shear; Figure 9, Cross-Slide Fastenings; and Figure 10, Complete Slide Assembly

The driving mechanism is quite simple to construct, and consists of a pair of gears, about 1-to-3 1/4 ratio, a three-step cone pulley, connecting rod, rocker arm, and link. The cast-iron cone pulley, after being turned to size, is bored to a driving fit on a bronze bushing, which also carries the 1 11/16-in. pitch diameter driving pinion. The whole assembly runs on a 3/4-in. shaft, 8 1/2 in. long, fastened in a boss on the frame by two 3/8-in. setscrews. A pinned collar holds the assembly on the shaft. The bushing is counterbored to act as an oil reservoir, and an oil hole should be drilled in it, tapped, and fitted with a screw, to permit easy lubrication.

The large gear, which is 6 3/8 in. in pitch diameter, is keyed to a 7/8-in. shaft, 4 in. long, which runs in a bronze bushing pressed into the boss in the frame, a pinned collar being used on the other end of the shaft. A 5-in. disk, made of 1/4-in. plate, is fastened to the gear by flat-head screws, the disk being held out from the gear by four sleeves, fitting over the screws. A slot is cut into the disk, from the edge, past the center, for the 1/2-in. crankpin. The crankpin can be moved to any position in the slot, to adjust the stroke of the ram, and clamped by tightening the steel bushing on which the connecting rod runs. A careful study of Fig. 3 will make all these details clear.

The connecting rod, as explained before, may be a casting, forging, or built up from cold-rolled steel, as may also the link and rocker arm; all should be fitted with bronze bushings, and provision made for oiling. The pins, including the crankpin, should be made of hardened tool steel, and are 1/2 in. in diameter.

Plenty of clearance, to allow the rocker arm to swing, should be allowed in the yoke of the link.

The method of building up the table slides is very clearly shown in Figs. 7 to 10. The shear, shown in Fig. 7, is a piece of 1/2 by 6-in. cold-rolled steel, fastened to the bed by 1/4-in. flat-head screws, spaced about 1/2 in. apart. The shear must be scraped flat and true, and fitted with a flat steel bracket for the feed screw.

The slide is fastened to the shear, as shown in Fig. 8, by means of angles made of 3/16-in. thick sections of angle iron, carefully machined and screwed to the slide. The cross slide is fitted in a similar manner, as in Fig. 9, and is bored out in the center to fit the lower boss of the table, and drilled and tapped for four 1/4-in. headless locking screws, as shown in Fig. 5. All plates are 1/2 in. thick, and the slide is fitted with two bronze nuts, to fit the 3/8-in. feed screws, as shown in the various drawings. The screws may be fitted with built-up handles, as shown on the cross-feed screw, or with handwheels made from old valve wheels.

The table slots should be cored in the casting, to the dimensions shown, to avoid a subsequent milling operation, and the table machined as indicated in Fig. 5. The four screws that engage its tapered lower face exert a downward pressure, holding the table firmly.

When it is desired to rotate the table for circular work, the clamp screws are loosened slightly, and the table turned by means of a bar inserted in one of the slots. By using a 12-in. bar, a very sensitive feed may be obtained. For taper cuts, the work is lined up with shims of the proper thickness.

Standard ¼-in. tool-steel bits are used for most work; for small internal slotting, ¼-in. tool steel, bent and forged to the proper shape, may be used.

A cone pulley, of the same size as that on the machine, is keyed on the countershaft, and a ¾-in. belt used.

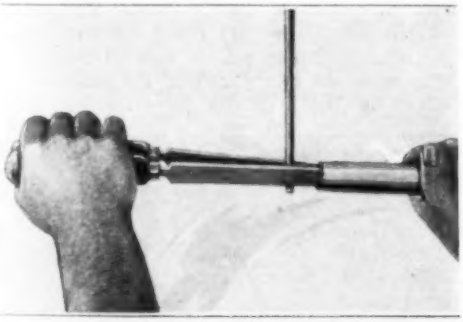
Engine Exhaust Heats Oil

To thin the oil in the cylinder oil cup of a gasoline engine during cold weather, arrange the exhaust pipe so that it directs the hot gas against the oil cup. This can be done by using a few elbows and some short lengths of pipe. The pipe used for this purpose must be of larger size than the regular exhaust pipe, in order to compensate for the increased back pressure that results from the use of the elbows.

Two Files Used for Gripping Tool

Two flat or half-round files and a short length of pipe will make an excellent substitute for pliers when these are not at hand or when they do not exactly answer the purpose. This gripping tool has been found very useful to remove dowel pins with protruding heads, when it is impossible to hammer them out, or difficult to pull them out with pliers; and also for removing the ends of bar stock that frequently stick in the collet of a screw machine or turret lathe.

The photograph shows how the tool is used. The ends of the files are stuck into

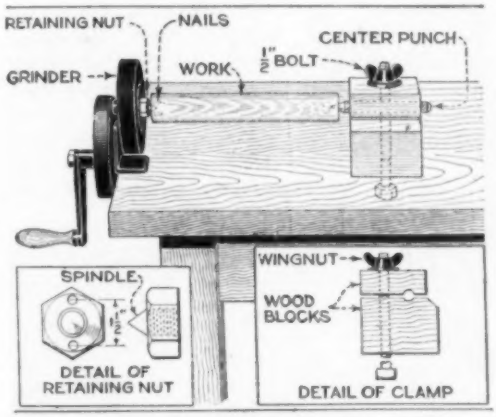


A Handy Gripping Tool, Improvised from Two Files and a Length of Pipe, Is an Excellent Substitute for a Pair of Pliers and in Some Cases Is More Suitable

the pipe and the pin is caught between them. By pressing the handles together, the files grip the work tightly. The crosscut surface of the files prevents them from slipping, no matter how hard they are pulled or turned around. Considerable leverage can be obtained by using long files and a long pipe.

Lathe Improvised from Hand Grinder

I was confronted with the task of making a number of turned wooden handles at a time when I could not get to a



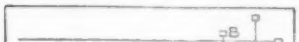
A Hastily Improvised Lathe That Accomplishes the Work of Turning Wood with Surprising Speed and Ease, Considering Its Crude Construction

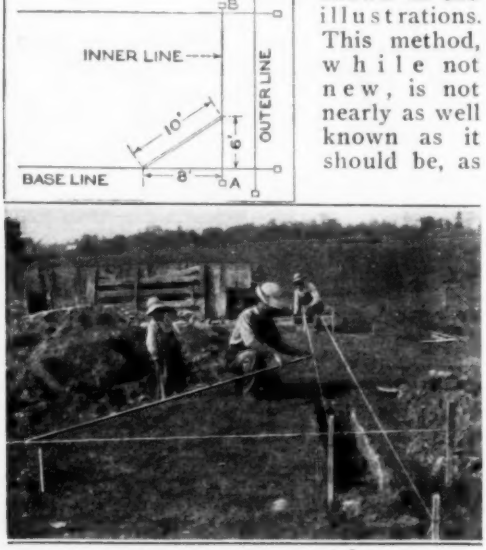
lathe; the job, however, was satisfactorily accomplished on a lathe hastily improvised from a hand-power bench grinder. Two small holes were drilled to a depth of ¼ in. in the face of the nut holding the emery wheel on the shaft. The holes were 5/32 in. in diameter, and spaced 1½ in. apart, as shown in the detail. The grinder was clamped firmly to the left end of the bench, and served as the headstock of the lathe. The tailstock and center were made from a center punch and a simple wooden clamp, as shown. A ½-in. bolt was used to fasten the tailstock in place on the bench; this bolt passed through a hole in the bench and was provided with a wingnut to permit adjustment of the center. The work to be turned was prepared by centering at each end, and driving two pins, made from nails, into one end, so that they fitted into the holes drilled in the nut of the grinder. The work was placed in position with the pins seated in the holes, and was held securely by bringing the center into place and tightening the wingnut. A block of wood served as a rest.

The arrangement may be improved upon considerably by filing down the end of the grinder shaft to a 60° point, like a lathe center. If it is not desirable to have a hole drilled in the bench, the tailstock may be nailed to a strip of wood and the latter clamped to the table with small C-clamps.—D. H. Palmeter, Detroit, Mich.

Laying Out Square Corners

The farmer who builds his own outbuildings will appreciate the method of laying out square corners for foundation walls shown in the illustrations. This method, while not new, is not nearly as well known as it should be, as





Laying Out Square Corners for Foundation Walls by Means of the 6, 8, and 10 Rule: This Is a Simple Method, and Quite Accurate

it is about the simplest method practicable with rough equipment.

Referring to the line drawing, a base line, of hard cord, marking the outer side of one wall, is stretched between two stakes, about 2 ft. above the ground. The other lines are squared from this one. As all the lines are squared in the same manner, the description of the squaring of the inner side of the adjacent wall, as shown, will suffice.

A stake, A, is driven into the ground outside the base line, and a line stretched, at approximately right angles to the base line, to another stake, B, lightly driven outside the outer-wall line on the opposite side. From the point where this line crosses the base line, a distance of 6 ft. is measured, and a mark made at this point on the line, by tying a small piece of colored twine on it. Then, from the same point, a distance of 8 ft. is measured along the base line, and a similar mark made. A light pole is cut exactly 10 ft. long, and a short stick nailed to it at one end, the stick being cut to such a length that, when the end is rested on the ground, the pole will be just at the height of the line. This end of the pole is then set exactly at the 8-ft. mark, the stake B lifted by a helper, as shown in the photograph, and moved until the pole touches the 6-ft. mark while still touching the 8-ft. one. The stake is then driven in firmly, and the line is square with the base line.

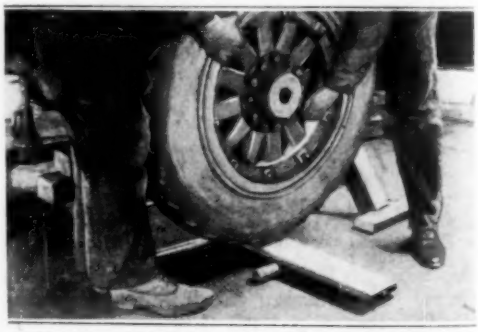
The trench may be laid out on the ground by holding a plumb bob so that the bob line just touches the lines stretched between the stakes, and making a spade mark at the point where the plumb bob touches the earth, or by simply using a straightedge, set on the ground and held against the line.

Removing Chatter Marks in a Countersink

In spite of all care a countersink will sometimes chatter or tear, and this spoils the appearance of a job. To remove the chatter marks, place a small piece of emery cloth, with the abrasive side downward, over the hole, and bring the countersink down. In a few minutes, all the chatter marks will be polished off.

Handling Heavy Truck Wheels

When it is necessary to reline the brakes of a heavy truck, or to remove the wheels for any reason, considerable trouble is usually experienced in handling the latter because of their weight. This objection, however, can be easily overcome by jacking up the truck so that a strong plank, on two rollers, can be slipped under the wheel to be removed. The jack is then lowered until part of the weight of the wheel rests on the board. With one man at either side of the wheel, it is now an easy matter to pull off the wheel without lifting it. The wheel is



A Simple and Quick Method of Removing Heavy Truck Wheels: A Strong Board and Two Rollers Bear the Weight

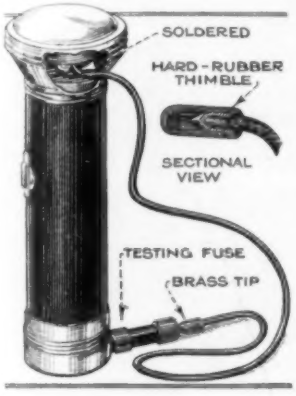
replaced by reversing the procedure.—Lowell R. Butcher, Des Moines, Ia.

Heater Used as Lamp

Needing some additional light in one corner of the office and not having any extra fixtures, I struck upon the idea of using the electric reflecting heater which was in the room. After removing the heating element from the socket and substituting a lamp for it, I found that the result was all that could be desired. The heater reflected the light just as well as it did the heat.—W. F. Schaphorst, Newark, N. J.

Testing Fuses with a Flashlight

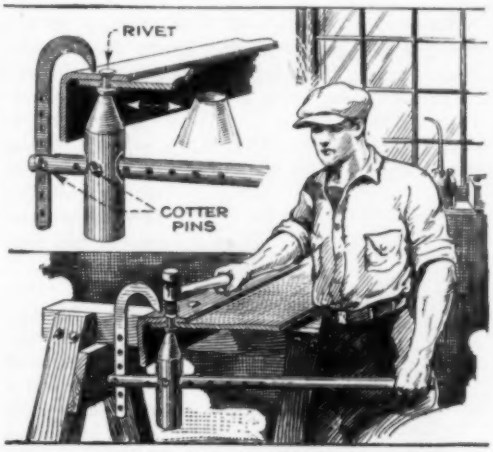
Maintenance electricians and mechanics will find the simple scheme of using a flashlight to test fuses, a good one. A small hole is punched or drilled through the metal lens case, so that the end of a length of stranded wire, such as lamp cord, can be pushed through. The end of the wire is bared, twisted around the screw shell of the lamp, and soldered. The other end of the wire is soldered to a brass tip. When testing fuses, one end of the fuse is held in contact with the metal cap on the bottom of the flashlight, and the brass tip is touched to the other end. If the fuse is in good condition, the lamp will light. A small hard-rubber thimble, to fit over the tip, should be provided to keep the tip clean.



Backing Tool for Riveting

The tool shown in the drawing, while primarily designed for use in tightening loose rivets in automobile frames, will be found useful in any shop where heavy work must be riveted, as it enables one man to do the riveting without a helper.

A piece of heavy round steel is used for the rivet snap, or anvil, and it is turned and cupped on the end to fit the rivet head, in the same manner as any other snap. It is drilled, a little above its center, to fit a heavy bar handle, and a cotter-pin hole is drilled at right angles to the handle hole. The handle is drilled, at intervals of about 1 in., with a series of cotter-pin holes, and slotted at one end to fit the flat-steel hook shown, a hole for a heavy pin being drilled through the slot jaws. The hook is also drilled at 1-in. intervals to fit the cotter, and the tool is assembled as shown.

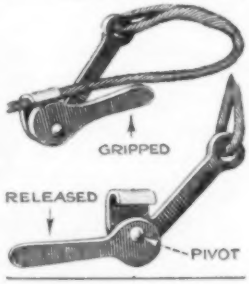


An Adjustable Backing Tool or Snap That Enables One Man to Do Heavy Riveting Single-Handed: It will Prove a Useful Tool in Any Shop

The manner of using the tool is obvious; the hook can be reversed when it cannot be caught on any portion of the work while in the position shown.

Dog for Adjusting Steel Cable

A steel cable is not considered so convenient as a chain for use as a towline, or for similar purposes, because its length cannot be adjusted so easily. However, this objection may be overcome by attaching an easily made dog to one end of the cable. The dog is made of ⅜-in. flat steel, shaped as shown in the drawing. A cam, with a handle, is riveted loosely to the body, off center, so that when the cam is set in the position shown in the upper view, the cable is gripped tightly, and when turned as in the lower view, the cable is released. With this device, the cable can be adjusted to any length desired.—Geo. G McVicker, North Bend, Neb.



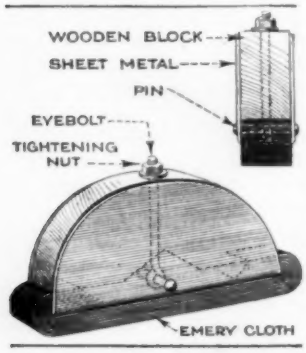
Tool for Spreading and Extracting Cotter Pins

In garages, where it is necessary to extract and spread cotter pins frequently, the special tool for this purpose shown in the drawing will be found of considerable utility. An old pair of pliers is forged and filed to the shape shown in the illustration, then hardened and tempered. A lip on one jaw opens the cotter pin and spreads it, while the notch in the other jaw prevents the head of the pin from slipping. The ends of the jaws are ground down to fit under the head of the cotter pin to extract it, as shown in the lower drawing. The jaw ends should be rounded, to prevent cutting the pin.

Polisher for Tempering

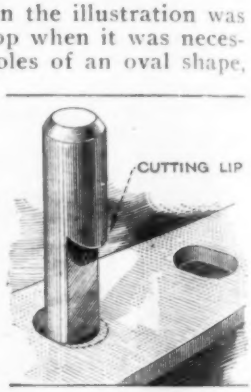
It is desirable to have a steel surface polished brightly before the metal is tempered, in order that the worker may be able to watch the color while tempering. An excellent emery-cloth holder, that has a soft backing, so that the abrasive surface will touch all parts when used on slightly uneven surfaces, is illustrated.

The holder is made from a disk of 1/16-in. sheet metal, bent at right angles near the center, leaving about 3/4 in. space between the two sides. A semicircular wooden block, 3/4 in. thick and 1/2 in. less in depth than the height of the sides of the holder, fits in this space. A notch is cut across the center of the block, as indicated by the dotted line in the drawing. A 1/4-in. hole is then drilled through the center of the sheet-metal sides, near the bottom. A hole is drilled through the wooden block, at right angles to the notch, for an eyebolt, the eye of which fits over a pin driven through the holes in the sides. The ends of the pin are riveted. Sheets of emery cloth are then torn into 3/4-in. strips; about 12 of these are used, the ends being caught between block and holder, and clamped securely by tightening the eyebolt. By using about a dozen strips of emery cloth, it is possible to polish the surface much better than if only one strip were used.



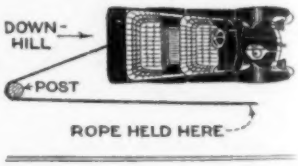
Elongating Holes in Plates

The tool shown in the illustration was used in a boiler shop when it was necessary to cut some holes of an oval shape, making the length 1 1/2 times the width. Several attempts were first made to do this by drilling, but the drill had a tendency to run into the hole already drilled. A special chisel, made as shown in the drawing, enabled the work to be done quickly. Chisel steel, of the same diameter as the holes, was used, one end being ground down, as indicated, to form a cutting lip about 1/8 in. deep. The chisel locates itself in the hole and cuts a good chip each time it is driven through.



Setting Contact Points on Automobiles

An automobile equipped with battery ignition must usually have the contact points adjusted, or at least checked up, once about every 2,000 miles; this is a rather difficult operation for the mechanic, unless the breaker box is unusually accessible, because it is hard to observe the cam while cranking by hand, and if the electric starter is used, it is hard to get the shaft to stop at just the right point. If the car is a light one, it can be put in high gear on a level road, and

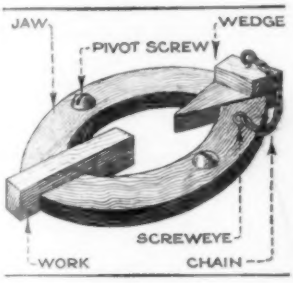


can be pushed along until the points are separated the maximum distance, when the hand brake is set to hold the car while adjusting the points.

With a heavier car, one man can still do the work, if there is a grade near by so that gravity can be utilized to help move the car. A strong rope is attached to the rear axle and brought around a tree or strong post, the rope being doubled if the car is heavy or the grade steep. While the rope is held taut from a position near the breaker box, the brake is released and the car allowed to move down slowly, by paying out the rope, until the contact points are wide open. At this position the brake is applied to hold the car, while the adjustments are being made.

Simple Planing Stop and Vise

One of the most important tools for the woodworker is his vise. Sometimes a vise is not at hand, and the woodworker is at a loss how to support his work. The illustration shows a very simple vise and planing stop that can be made at small expense; it will grip the work securely, and, if properly made, is practically unbreakable.

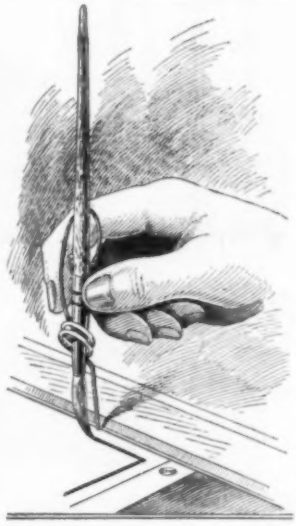


The vise consists of two curved pieces of hardwood, of a size suitable for the work for which it is to be used. A generally satisfactory thickness is about 1 inch. The pieces are pivoted at their central points on long screws that extend into the bench, or other support on which the vise is fastened. At one end each of the jaws is beveled so that a wedge can be driven between them to clamp the opposite ends on the work. To enable the wedge to be readily driven out again, a cleat is nailed on it, as shown. It is a good idea to connect the wedge to one of the jaws with a short length of chain and two screweyes, one driven into the cleat, the other into the jaw.—H. G. Schultz, Teaneck, N. J.

¶For every 10° F. added to the temperature of feed water by exhaust steam, nearly one per cent of fuel is saved.

Brush Attachment for Drawing Borders

The brush attachment illustrated is used for drawing clean, straight borders on showcards and similar work. The attachment can be made by anyone in a few moments with the help of a pair of pliers. A piece of soft-iron wire, about 8 in. long, is formed to the shape shown; two coils are made about 2 in. from one end by winding the wire around the cap of a fountain pen, or other round article of about the same diameter. The other end of the wire is then bent up to form an oval loop, as shown, so that when the arrangement is slipped onto the brush, the coils and loop will grip the handle securely. The spacing of the border from the edge of the card can readily be varied by bending the end that is drawn along the edge of the T-square or triangle.—E. E. Knight, San Diego, Calif.



Gilding Small Articles

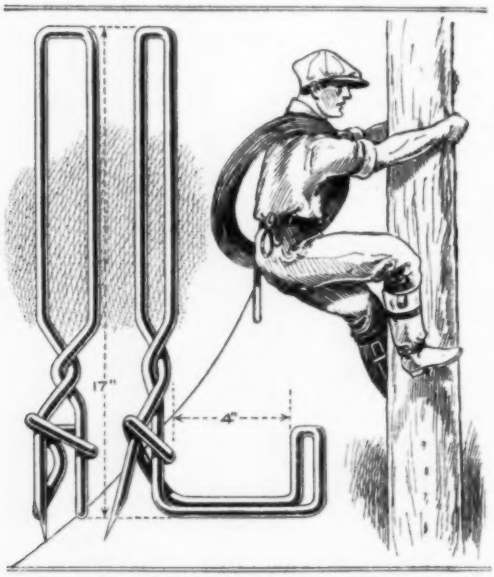
Small articles can be gilded in the following way: Dissolve, in 8 oz. distilled water, 1 oz. of cyanide of potassium (poison), and 32 gr. of chloride of gold, and shake well to insure thorough mixing. Cut a strip of sheet zinc, and bend it to form a hook to fit the article.

Put some of the solution in a glass or earthenware dish, then scour the article with baking soda and water to remove all dirt and grease, rinse it off, and suspend it by means of the zinc hook in the solution, until it appears very dark in color. It is then removed, and again scoured with brush and soda, which will bring out a beautiful gilded finish.

If a Roman finish is desired, the articles must be satin-finished with a wire brush before dipping, but if an English finish is desired, they are polished before dipping.

Emergency Climbing Irons

On a possum-hunting party in southern Maryland, the hunters were assembled and everything in readiness, when it was discovered that climbing irons, which were very necessary items on this trip, had been forgotten. A trip back for these was out of the question, as the time involved would mean too long a delay. The hunters were decidedly at a loss, until some one suggested applying for help to a blacksmith who lived near by.



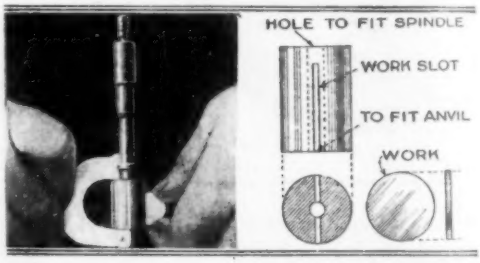
Climbing Irons Made of Four-Foot Lengths of ¼-Inch Steel Rod, That will be Found Very Serviceable by Linemen

The ingenious blacksmith turned out several pairs of the irons shown in a short time; each one was made of a 4-ft. length of ¼-in. steel rod, bent to the shape shown in the drawing. One end was sharpened to a point and tempered, while the other end was formed into a 4-in. stirrup and bent around the first to strengthen it. The climbers thus made served the purpose just as well as purchased ones, and were found heavy enough to stand hard usage. Leather straps from the tire holders on the automobiles were used to hold the climbers in place. Such climbing irons can be easily made in any blacksmith shop, and many uses can be found for them around industrial establishments, and by power, telephone, or telegraph linemen.

¶Do not heat the work above a bare red heat when casehardening for colors, using cyanide.

Measuring Disks in Micrometer

Some kinds of work are rather difficult to measure with a micrometer. Thin round pieces, for instance, may easily be measured incorrectly if care is not taken to see that the work is held in the center of the measuring faces, and at right angles to them. Recently, among a batch of ¾ by 1/16-in. disks, a number were found to exceed the tolerance allowed on the diameter, and it became necessary to measure the whole lot. The man to whom this inspection job was given made the simple attachment shown in the illustration, to save the time and trouble required in adjusting the pieces squarely between the micrometer anvil and spindle. The attachment is a short piece of cold-rolled steel the same diameter as the disks, drilled in the center a running fit for the micrometer spindle, and slotted with a saw a little wider than the thickness of the disks. With this little device, the job was done in a short time, as it was simply a matter of inserting the disks in the slot until the edges were flush with the attachment, when the measuring could proceed with safety, as the work was thus located square and central. After the disk was measured, the micrometer was tipped over as the spindle was turned back, releasing the disk and allowing it to fall out into a box.



Simple Attachment for Measuring Disks with a Micrometer Caliper That Insures Each Disk being Held Square and Central between Spindle and Anvil

A Color Code for Fuses

In a large industrial building where renewable fuses of various capacities, but of the same cartridge size, are used, a color-code system to distinguish between the fuses has been found very useful.

The fuse cartridges are painted in different colors to indicate the capacities of the links contained in them. For instance, with the small cartridge fuse having a maximum rating of 30 amp., there are in use five kinds of links, of 5, 10, 15, 20, and 30-amp. capacity. For these links,

the colors white, green, blue, yellow, and red are used, respectively. For the next size of cartridge, having a maximum rating of 60 amp., a similar code is used.

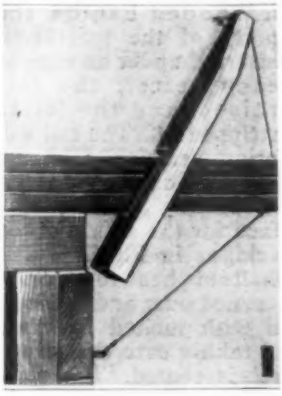
With this system, the size of fuse necessary to make renewals can be determined at a glance, insuring proper renewals without the danger of under or overfusing.

Protecting Ladle When Melting Babbitt

When starting to melt a ladleful of babbitt, put some machine oil, or grease, or even some resin, in the bottom of the ladle. This will quickly melt and catch fire, and while burning out, will melt some of the babbitt, causing it to flow down into the bottom of the ladle. This thin layer of melted babbitt will quickly conduct away the intense heat of the fire to which the bottom is exposed, and prevent it from burning out. The oil or grease will not spoil the quality of the metal.—H. Bethuel Kingsley, Fort Miller, New York.

Simple Woodworker's Clamp

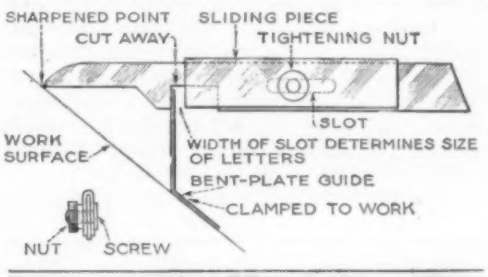
A piece of wood, cut out and fastened to the workbench with wire, as shown in the drawing, makes a very handy clamp for holding several boards together at one end while working on them. This clamp is much more convenient for this purpose than an ordinary pair of wood clamps, and requires less time to adjust.



It is preferable to make this clamp of hardwood. The slot, cut out near one end, as shown in the drawing, should have rounded corners and beveled edges to prevent marking the boards on which it is used. Two screweyes and a piece of heavy flexible wire are used to attach the clamp to the side of the workbench. The wire is brought around the ends of the boards, the clamp placed on them, and the boards then shoved against the wire; this pulls the upper end of the clamp down and squeezes the boards together.

Tool for Etching Steel

The etching tool shown in the photo can be made very cheaply, and forms a



A Useful Lettering Tool for Etching Steel: The Height of the Letters is Kept Uniform and the Lettering Thus Presents a Neat Appearance

very useful device for etching lettering on steel. Beeswax and acid are used in the ordinary way, the purpose of the tool being to keep the letters in a straight line and of the same height, thus giving the inscription a neat appearance, in keeping with well-finished work.

The tool consists of three parts: the lettering tool, a sliding distance piece, and a guide, made of flat plate, bent to the shape shown. The lettering tool has a slot cut in the bottom, and is also slotted in the center, for a small clamp screw. The sliding piece is a piece of stock of the same thickness as that used for the tool, doubled to fit over the latter, and drilled for the clamp screw. By moving this piece, the width of the slot can be varied to suit the size of the letters required.

The guide plate is clamped to the work as shown in the photo, and the tool is used with the edge of the guide in the slot. It may easily be seen that the height of the letters must be uniform, as the tool can only move a distance equal to the width of the slot, when making the vertical strokes of the letters.

Making Clean-Cut Metal Stencils

By JAMES TATE

STENCIL cutting, as usually undertaken by those not "in the know," consists in attempting to cut the thin sheet brass or zinc with a chisel, or similar tool. The results are invariably unsatisfactory, as the edges of the cuts are ragged, and, when filed smooth, the proportions of the letters are changed; a burr is also thrown up on the underside of very thin stock that no subsequent hammering or filing will remove.

A simple method, and one that produces excellent work, is to etch the designs with acid. Using this process, the metal is left perfectly flat on both sides, and the outlines of the characters are smooth and regular. The stencils, particularly if made of zinc, can be produced very quickly, no great skill is required, and there is no need of finishing after the etching has been completed.

To make a stencil in zinc, which is about the easiest metal to etch, cut the plate to size, lay it on a smooth, flat surface, and coat one side lightly with melted beeswax. The plate is then warmed slightly, to melt the wax again, and, while the latter is still soft, a sheet of lead foil, cut to the same size as the plate, is laid over it, as shown in Fig. 1, and rubbed into close contact, with a piece of hard felt or similar material. The lead foil can be obtained from any florist, or electrical-supply house, and is very cheap.

The foil is now given a light coat of beeswax, and this leaves the surface ready for the lettering to be drawn or traced upon it, with a pencil or stylus. When drawing in the lettering or design, provision must be made for the ties that hold the center portions of such letters as O, D, and C to the rest of the plate. The outlines of the lettering are then cut through with a fine, sharp-pointed knife—a photographer's etching knife makes a good tool for this—as shown in Fig. 2. The foil background is now stripped from the plate, leaving it as in Fig. 3, with only the foil lettering remaining on it. The next step is to paint the whole surface, including the foil letters, with asphaltum paint, or electrotypers' varnish; then the letters are stripped from the plate. This is best done with a needle or pin, stuck into a wooden handle, the point of the tool being inserted under an edge of each letter, the foil raised, and the letter stripped off. The foil will bring practically all the beeswax on the zinc with it, leaving a clean surface for the action of the acid, as in Fig. 5.

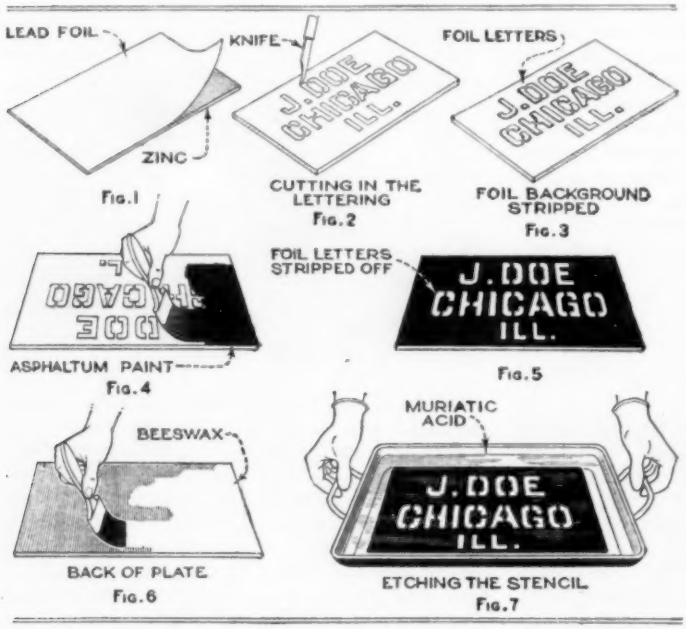


Figure 1, Applying the Lead Foil; Figure 2, Cutting In the Lettering; Figure 3, Plate Ready for Painting; Figure 4, Painting the Plate; Figure 5, Plate with Lettering Stripped; Figure 6, Preparing the Plate for Etching; and Figure 7, Etching the Work

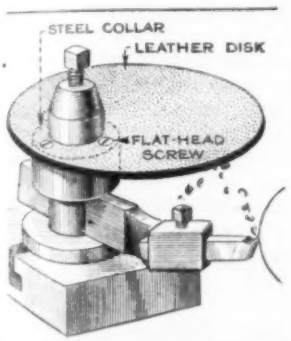
After the asphaltum has thoroughly dried, the plate is turned over and the back and edges coated with melted beeswax, using a brush, and taking care that every part of the surface is coated. The plate is now ready for etching.

The acid used is muriatic acid, and is poured into a shallow enameled tray. The plate is placed in the tray, face up, and the tray kept in motion until the acid has eaten through all the lettering. Care must be taken not to allow the acid to splash on the face or hands, or to inhale the fumes given off. When the etching is finished, the work is removed and washed in running water, when the asphaltum may be removed with gasoline, and the beeswax with hot water.

If asphaltum, or electrotypers' varnish, is not easily obtainable, melted beeswax can be applied to the face of the work instead, although it will make the work of removing the foil lettering a little more difficult.

Simple Chip Shield

The practice of turning brass, bronze, and similar metals at high cutting speeds often results in injuries to the operator's eyes by flying chips. This is, in most cases, easily avoided by the use of a guard or shield, the use of which should be made compulsory. A very simple chip guard is that shown in the drawing; it consists of a leather disk, screwed to a steel collar, the latter being a loose fit over the toolpost. The leather itself should be a "wringing" fit on the toolpost, and the hole should be off center, so that the disk can be swung to one side or the other to suit the work, or when necessary to change tools.



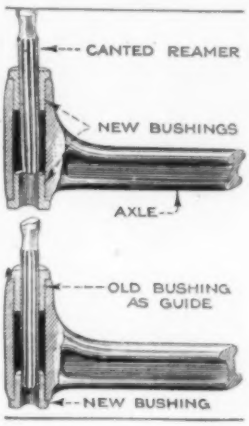
Removing Stripped Wood Screws

It often happens that wood screws cannot be unscrewed, because there are no threads in the wood; they may have been stripped by giving the screw a few extra turns when driving it in, or the threads may have disappeared due to dry or wet rot.

To remove the screw without marring the surface of the wood, the method illustrated may be used. Drive a finishing nail into the wood, as indicated, so that its end will come in contact with the screw thread. The screw can then be removed easily. The small nail hole is easily puttied or otherwise filled, so as to be scarcely noticeable.—H. H. Siegele, Emporia, Kan.

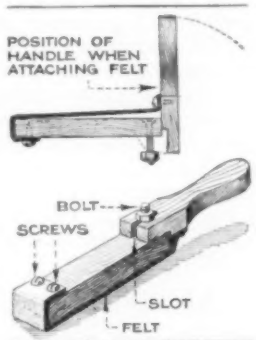
Reaming Axle Bushings

When inserting new front-wheel spindle bushings, it is poor practice to drive out both old bushings, and press both of the new ones in place at once, then ream them from the outside of each bushing. The result of this is that the reamer is often canted, and the hole reamed at a slight angle. To ream the holes correctly, one old bushing should be left in place to serve as a guide, as shown in the lower view. When the bushing has been reamed to size, the old one is pressed out, and the second bushing pressed in and reamed, using the first one as a guide. By employing this method the bearing of the spindle bolt can be made practically perfect.



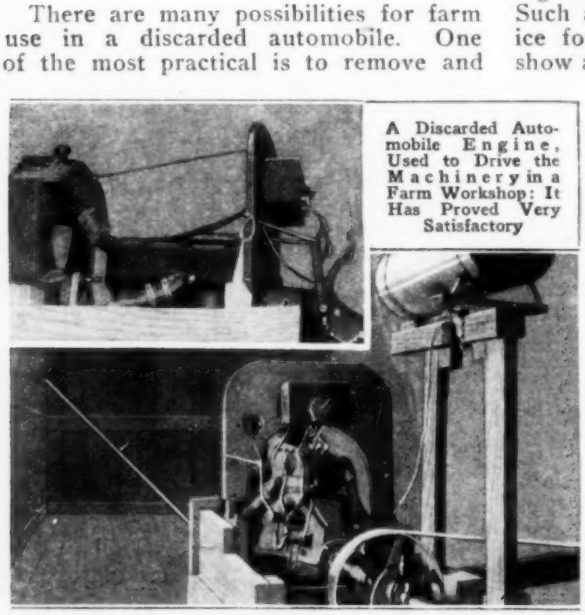
Felt Pad for Wiping Solder

A handy tool for wiping the surplus solder, when tinning the ends of pipes, or similar work, can be made very easily from two pieces of hardwood, one — the holder proper — being left plain, the other shaped to fit the hand comfortably. This handle has a step cut out at one end, and is slotted, at the same end, as shown. A piece of thin felt is fastened to the holder by screws, brought around the end, and screwed to the handle while the latter is in the position shown in the upper view. In order to stretch the felt tightly, the handle is then pulled down in line with the holder and secured with a screw and nut. Thus the whole working surface of the pad is free from obstructions, nails, screws, etc., and the material cannot "bunch" or crumple up after a short time in use.



Auto Engine as Power Plant

There are many possibilities for farm use in a discarded automobile. One of the most practical is to remove and overhaul the engine and adapt it for driving the machinery in the farm workshop. Such a power plant will give good service for several years. The illustrations show an engine taken from a light car and mounted on a wooden bedplate. The only change made in the arrangement of the parts was to mount the gas tank on a high wooden frame, and to extend the transmission shaft; this extension carried the driving pulley, and was journaled in pillow blocks, fitted on each side of the pulley.



A Discarded Automobile Engine, Used to Drive the Machinery in a Farm Workshop: It Has Proved Very Satisfactory

The engine is operated exactly as when in the auto, high, low, and reverse speeds being available. After the cylinders had been reground, and new rings fitted, and when the plant had been in operation for some time, a test was made to determine the power delivered at the pulley. This proved to exceed 12 brake horsepower.—Dale R. Van Horn, College View, Neb.

Extinguishing Burning Oils and Greases

An experiment recently made to ascertain the most efficient fire extinguisher for burning oils, fats, greases, and similar substances developed a number of interesting facts.

In the majority of liquid fire extinguishers, the active agent is carbon tetrachloride, which is a noninflammable liquid at ordinary temperatures, vaporizing rapidly at a comparatively low temperature. The vapor is also noninflammable, and is heavier than air. When carbon tetrachloride is thrown upon burning wood, paper, oily waste, and similar material, the vapor formed excludes the air and the fire is smothered. However, oils or oily substances are soluble, or partly so, in carbon tetrachloride, and should this liquid come into contact with oil which is later used in the manufacture of food products, it is probable that under certain conditions the odor of the chemical would be very easily noticed. Another drawback in using the majority of liquid fire extinguishers on burning oil is that it produces an effect very similar to that of throwing water in a tank of burning oil, increasing the fire hazard because of the danger of setting fire to the building.

Most dry extinguishers contain a considerable amount of ammonium carbonate. This substance, when thrown upon burning grease, causes the latter to foam and swell, and if a kettle filled, or even partly filled, with oil or fat should take fire, and ammonium carbonate is thrown into it, causing it to foam, the vessel will in all probability overflow and in this way endanger the safety of the building.

Experiments made with flour indicated that good results would be obtained if the fire were quickly covered with a large quantity. Flour works very well with a small volume of oil, but the quantity required to put out a fire in a good-sized vessel would cause the oil to flow over the sides, and for this reason flour, unless very quickly and carefully applied, does not always give good results.

Dry sawdust takes fire readily, and unless a quantity sufficient to smother the fire is at once thrown upon the burning oil, the sawdust will feed the flames instead of quenching them. Wet sawdust thrown on burning oil produces an effect somewhat the same as water, so it is apparent that neither wet nor dry sawdust is good material to use in extinguishing a fire of this nature.

Of all the substances tested, baking soda proved to be the most efficient for putting out a fire in which fats, oils, or greases were involved. The baking soda should be dusted to a depth of about ¼ in. over one half the surface of the blazing oil. The gas formed by the decomposing

soda spreads over the uncovered portion of the blaze; this blanket of heavier-than-air gas prevents the oxygen of the air from coming into contact with the oil, and in this manner the fire is smothered.

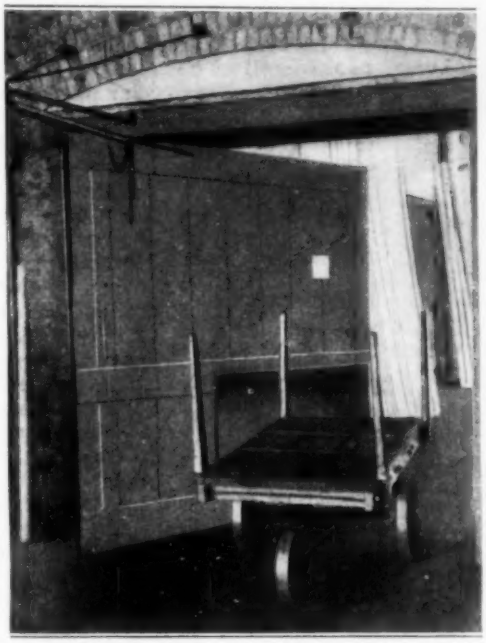
It is essential that the baking soda be in the form of a very fine powder, for if it lumps or cakes, the lumps sink and gas is liberated below the surface of the oil; this causes the oil to foam and swell, and consequently there is danger of the oil overflowing the sides of the vessel. To prevent the baking soda from lumping in the container, mix it thoroughly with 30 per cent of very fine sand, and it will be found that the mixture is but little less effective than the pure soda.—E. O'Connor, Davenport, Ia.

Tool for Cutting Corrugated Roofing

Cutting corrugated roofing with a pair of ordinary tin snips is a tiresome job, and one that is usually rather rough on the hands. The simple tool shown in the illustration, which is made from an old pitchfork and works somewhat like a can opener, will be found much easier on the hands. The tines of the fork are cut to a length of about 4 in., and bent until the points are about 2 in. apart. The middle tine is then bent downward, as shown, and sharpened to form a cutting knife. When cutting, the outer tines will run in the corrugations on either side of the line of cut, keeping the cut straight. —H. J. Engel, New Braunfels, Tex.

Hanging a Double-Swing Door

The photograph shows a factory door that swings in either direction and closes itself through the action of a strong coil spring. It is not necessary for the workman to stop to open the door, but simply to push the truck against it. This door is not of the common hinged type, but swings on two pivots located above and below the door, about 1 ft. from the side



Double-Swing Door in a Factory, Opened by Simply Pushing the Trucks against It: A Spring Attachment Makes It Self-Closing

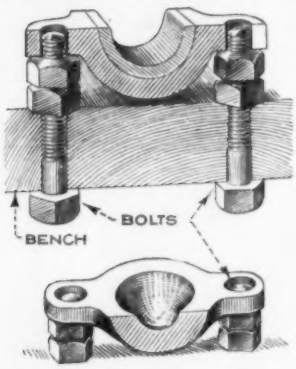
jamb. The only equipment required to make it self-closing, is a heavy coil spring, a wall bracket from which to extend the spring, and two lengths of chain for attaching the spring to the door in the manner indicated. The spring is brought into tension when the door is opened in either direction, owing to the fact that one chain extends to each side of the pivot on which the door swings. The woodwork of the door is protected from damage by sheet metal, fastened on each side at the height of the truck bodies.—Orin Crooker, Wheaton, Ill.

Drilling Horizontal Holes Straight

Anyone who has ever used a brace and bit knows that in the drilling of horizontal holes there is a great tendency to raise or lower the brace a trifle while drilling, which, of course, results in the hole being drilled at an angle. To overcome this tendency, slip a large washer over the bit so that it rests on the smooth shank. As soon as the bit is held at an angle the washer will travel one way or the other, and the workman can correct the fault instantly. The washer should be free from burrs.

Filing Bearing-Cap Faces

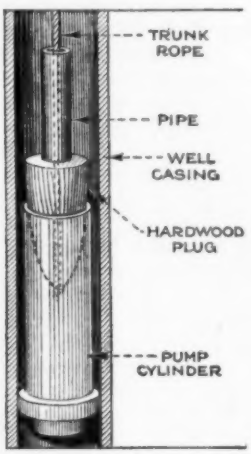
When filing down the flat faces of caps of connecting rods, bearings, and steering-gear connections to compensate for wear, the caps cannot always be held in a vise conveniently, because of their shape. An excellent method of holding them on the workbench is shown in the illustration.



Two holes are drilled in the workbench; these are spaced apart the same distance as the bolt holes in the cap. Bolts are pushed through the holes from underneath, and nuts screwed on, to hold the bolts in place and to serve as seats for the caps. Although this method may not appear to provide a substantial support, it has been found that the cap can be filed down without any tendency to rock, providing the lowest part of the curved surface rests on the bench.

Recovering Pump Cylinder from Well

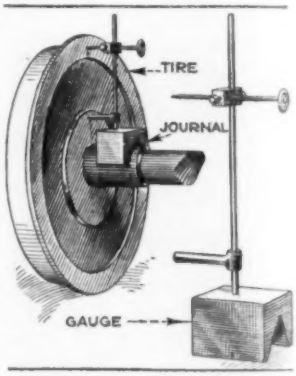
Workmen repairing a casing well had the misfortune to drop the pump cylinder to the bottom of the pipe, about 120 ft. below the ground. To raise the casing was, of course, out of the question. The only method of recovering the cylinder was to use some device, which, when lowered from the top by a rope, would engage the cylinder and draw it up. The device used is shown in the illustration.



A piece of hardwood, 10 in. long, was rounded to form a tapering plug, the outside diameter of which just exceeded the inside diameter of the cylinder. A hole was drilled through the plug lengthwise, and a trunk rope passed through it and tied. After the plug was lowered in the casing, and when it was felt that the small end had entered the cylinder, a length of 1-in. pipe was slipped over the rope and allowed to drop on the plug. The impact of the pipe drove the plug into the cylinder. It was then an easy matter to lift the cylinder to the surface.

A Tire-Setting Gauge

In the shrinking of steel tires on railroad-car wheels, the side of the flange must be kept parallel to the flange of the hub liner. Measuring with a small gauge or scale is by no means easy or comfortable, as it must be done while the tire is hot. A gauge that has been especially devised to overcome this objection, and that enables the worker to accomplish the work with speed and accuracy, is shown in the illustration.



The gauge has a cast-iron base, the underside of which has a V-notch milled in it to fit on the journal. A long steel rod is driven into a hole drilled in the base, and is fitted with two fingers. The lower one is attached permanently to the rod, and, in use, is set against the liner. The upper finger is fitted in a sliding block. When the lower finger is set against the liner, the block is moved up until it is opposite the tire, then locked by a setscrew. The finger is then moved in until it touches the tire and is locked, and the gauge is swung around the journal. It is thus an easy matter to set the tire perfectly parallel with the liner.—W. S. Pickerell, Spokane, Wash.

¶An emergency valve-grinding tool can be made from a piece of broom handle, a thin piece of sheet metal, driven into the end, and two pins to hold the sheet metal in place. To operate the tool thus improvised, hold it between the palms and twirl around by moving the palms back and forth.

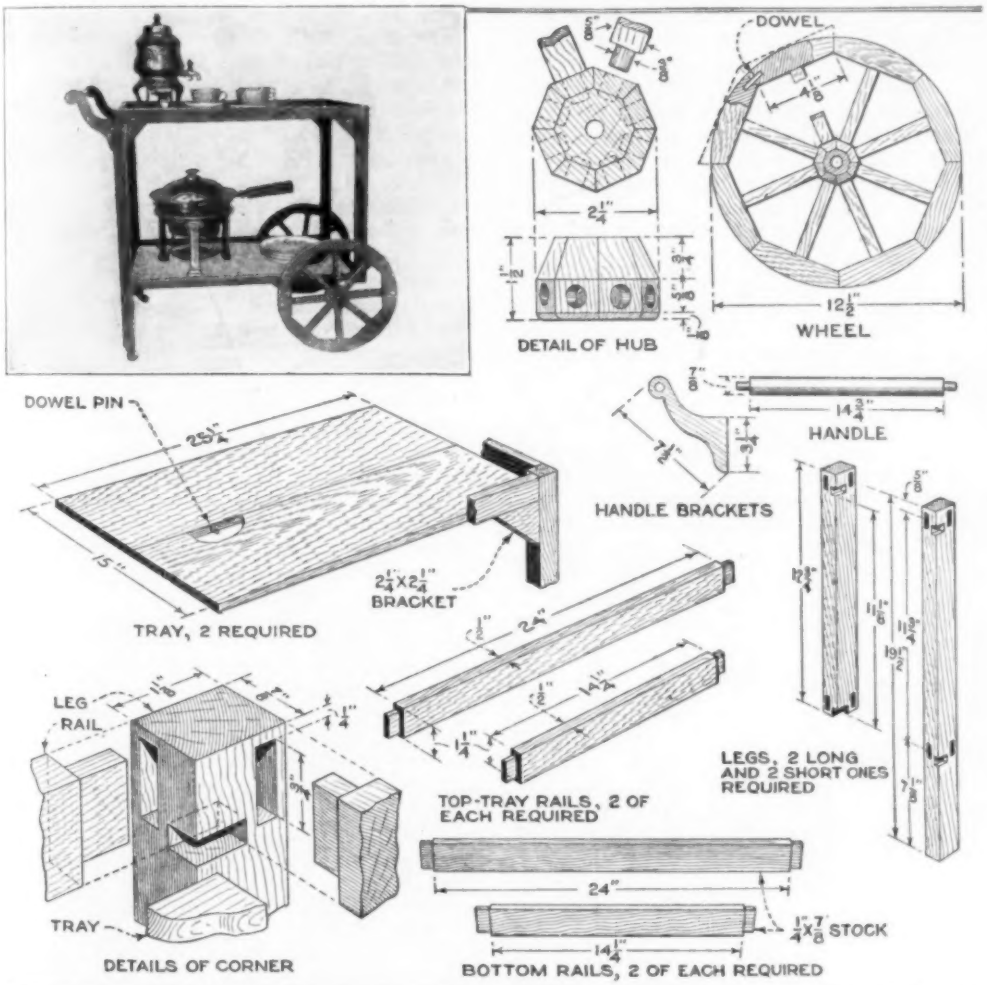
Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Homemade Tea Wagon

By E. E. SCOTT

THE tea wagon is a true boon for the busy housewife, as it saves many of the innumerable steps between dining room and kitchen, necessary in carrying in meals, and removing dishes.

The material for all parts of the tea wagon shown, except the wide boards for the trays, is mahogany, obtained from the scrap pile of a chair shop, and costing only 50 cents. The trays are made of



Full Details and Dimensions of a Tea Wagon That can be Made Very Cheaply at Home: Most of the Parts can be Made of Scrap Stock, and the Construction Is Simple. The Photograph Shows the Completed Wagon

½-in. pine boards, doweled and glued together as shown in the detail.

The making of the wheels is the only operation that is at all difficult and demands explanation, but, with a little care in mitering the separate sections, the work is comparatively easy. The wheels should first be laid out, full size, on a sheet of cardboard, and one rim section cut out to the shape indicated by the dotted lines, to serve as a template. The stock should be marked by means of the template, but cut in a miter box set to a 22½° angle. The ends of each section must then be carefully "sliced" with a keen plane, to make as perfect a fit as possible, then doweled and glued as shown, notches being cut in the corners, and the rough segments bound together with wire until dry. The octagonal hub and square spokes are then made and glued together, and the assembly, when dry, carefully centered within the rim. The spokes are marked, cut to the proper length, and nailed to the rim with 1-in. brads, one on each side of a spoke.

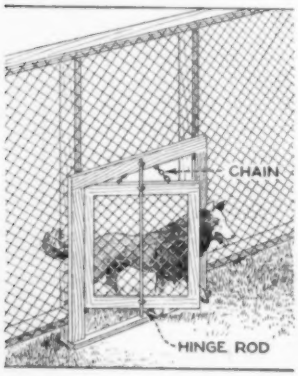
With one leg of a pair of compasses at the center of the hub, a 12½-in. circle is described on the rim, and it is trimmed to shape with knife, file, and sandpaper. If desired, a groove can be cut in the rim and rubber tires fitted.

The remainder of the work is mainly a case of "cut and fit," all the details and parts being shown in the drawing. The axle brackets are fastened to the lower tray by three long screws, the wheels being attached to the brackets by square-head brass bolts, 2½ in. long. A pair of ordinary casters are fitted to the rear legs. Screws are used to fasten the angle braces on the trays, and also for the handle brackets. The remaining parts are carefully mortised, glued, and nailed with small brads. Prepared liquid glue should not be used; use the hard, flaky patternmakers' glue obtainable at most hardware stores, and melt it in a regular gluepot.

The finish will, of course, depend upon the material used and the maker's taste, but the woodwork should be as finely finished as possible before any stain is applied, and, if the wood is open-grained, a good paste filler should be used after staining. Do not use a varnish stain, but obtain a good stain or wood dye, and follow the maker's directions closely.

Gate for Dog Built in Fence

It is generally desirable to give watch dogs free entry and exit to the house yard of a farm, especially at night, and for this reason one of the gates is usually left open; this, however, does not exclude poultry or cattle from the yard. This objection can be easily overcome by providing a self-closing gate that can be opened with little effort by the dog.



The gate can be built in any fence, can be made of any suitable size, and can be adjusted so that more or less effort is required to open it. It is held in a suspended position by two short chains as shown, and swings on a vertical rod that passes through screweyes driven into the frame, as indicated. It must be balanced as perfectly as possible so that the chains will close it again after it has been opened. The force required to open the gate depends on the distance that the chains are spaced from the hinge rod; the farther they are spaced from it, the more force is required, and vice versa.

The edges of both gate and opening are, of course, perfectly smooth, to eliminate possible danger of injury, and sufficient clearance must be left between the top and bottom of the gate to insure easy operation.

Hints for the Home Typist

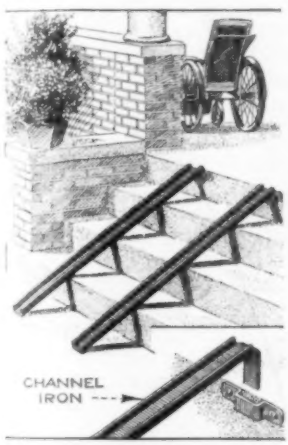
To facilitate handling the paper and carbon sheets when making several copies on a typewriter, the following expedient has been found very helpful: Select a sheet of light but tough paper, the same width as the carbon sheets, but about 1½ in. longer. Place the carbon sheets, face downward, on this paper and fold the projecting end over the top of them. Then sew the carbon sheets in this fold securely on a sewing machine, about ½ in. from the fold, using a rather long stitch. In using this carbon arrangement, each sheet of paper is pushed up under the flap as far as it will go, and the platen release is used when inserting the sheets into the machine.

Replacing Gaskets

Shellac is very often used when putting in a new gasket. This is, however, bad practice, as a new gasket will compress enough to make a good joint, it being necessary only to rub a little grease on both sides, and the use of shellac means that the gasket will be torn when removed. When replacing an old hard gasket, shellac must be used, but it is better not to use old gaskets at all.

Track Aids in Pulling Buggy over Steps

A detachable track has been found to be a great aid in pushing a baby cab or invalid chair over a flight of steps. Two lengths of channel iron, wide enough to accommodate the tire of the vehicle between the flanges, are used for the tracks. At one end, both flanges are trimmed off for about 2 in., and the web is bent down to form a hook. Light flat-iron brackets, bent U-shape, are screwed to the riser of the top step to accommodate the hooks, so that the web of the channel will come flush with the tread of the step. The tracks are spaced to suit the wheels of the cab or chair. When not in use the tracks can be laid aside. If the steps are of concrete, expansion bolts can be used to fasten the brackets, holes being first drilled in the step with a common star drill.

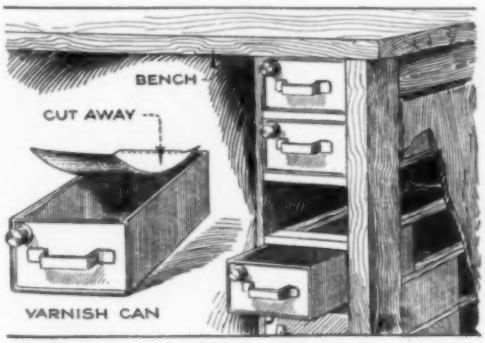


Replacing Fan Belts

Trouble is often experienced when replacing fan belts on small cars having a crank that is not detachable, because there is very often too little space between the crank and the lower fan pulley. This trouble can be eliminated by cutting off, with a hacksaw, part of the four teeth of the crank that engage with the pin on the end of the shaft. Of course, care must be taken not to cut off too much, or the crank will be ruined.

Drawers Made from Varnish Cans

Ordinary varnish cans of 1 or 1½-gal. size can be turned into very serviceable and durable drawers for holding small tools, nails, screws, putty, and, if desired, liquids. One side of the can is cut away as indicated. The sharp edges remaining are bent or hammered down so that there will be no danger of cutting the hands. A number of slides on which the cans may run easily can be arranged underneath the workbench, as shown in the illustration, or if desired, a special frame can be built to contain them, making a neat storage cabinet.—Harry W. Poor, Boston, Mass.

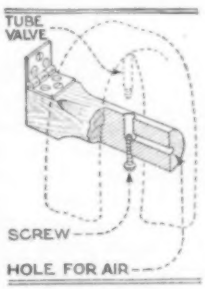


Serviceable and Durable Drawers, Made from Varnish Cans, Provide Excellent Storage Space in Any Workshop. They may be Arranged under the Bench, or a Frame can be Built to Contain Them

Simple Tube Deflater

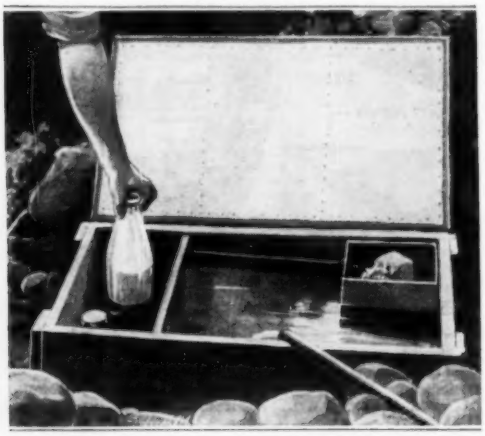
A device for deflating inner tubes is shown in the illustration. It can be constructed in a few minutes and is very useful in any garage, as it eliminates the necessity of removing the valve, or of searching for a piece of wire to push it down.

Two small holes are drilled in one end of a piece of wood in the manner shown. The hole in the side is large enough to allow a valve stem to be inserted, while the hole in the end permits the air from the tube to escape. A machine screw is driven into a smaller hole in line with the first hole, and extends about ⅜ in. into it. The end of the screw fits inside of the valve stem, and holds the valve open.—J. J. Ginsberg, Brooklyn, N. Y.



Refrigerator for the Camp

An excellent refrigerator for the camp or summer cottage can readily be made by lining a wooden dry-goods box with



A Wooden Dry-Goods Box, Lined with Galvanized Iron and Divided into Several Compartments, Makes an Excellent Refrigerator for the Camp

galvanized iron, soldering all seams, so as to make it water-tight. This refrigerator also serves as a drinking tank.

The refrigerator has three compartments; the large one is used for the drinking water, the one at the left in the photograph for cream and milk bottles, and the smallest one for meats and vegetables. The two larger compartments are made by making a partition across the box, but the smaller one is simply a removable galvanized iron box. The compartments can be made any size.

Water from a spring is led into the box by means of a length of pipe, and flows from the main compartment into the smaller one through a hole drilled in the partition. A drain hole is drilled in the outer side of the second compartment so that the surplus water will flow out. This hole is drilled at about two-thirds the height of quart-size milk bottles. The hole in the partition may be higher than this, so that the level of the water in the largest compartment will reach nearly to the top of the small meat box.

It has been found that a refrigerator of this type, about 3 ft. by 18 in. by 12 in. in dimensions, will keep milk and cream sweet for three days during the hottest weather.—Harry F. Blanchard, South Glenn Falls, N. Y.

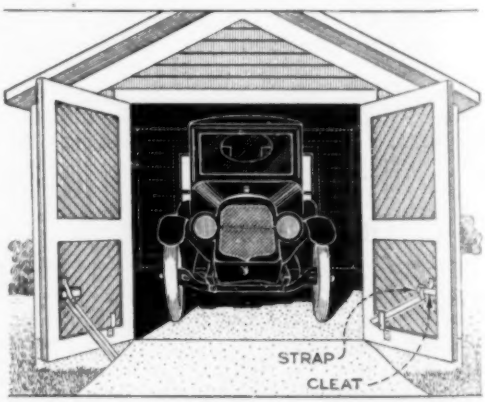
¶Steam for small toys may be obtained by connecting a rubber tube to the valve of a steam radiator.

Winding Electrical Coils Tightly

Most experimenters, working with electrical coils, find great difficulty in winding the wire so tightly that the coil, when finished, will have the neat appearance of machine-wound coils. It is well known that copper possesses a high heat-expansion rate, and this fact can be applied in coil winding, to make a neat job. By placing the wire over the stove, or other source of heat, until it is thoroughly warmed, and keeping the temperature as high as possible during the winding operation, surprisingly good results will be obtained. In following this method care must be taken to see that the ends of the wire are securely fastened, to prevent them from loosening when the wire contracts upon cooling. When it is understood that 100 ft. of copper wire expands nearly ½ in. when raised in temperature about 30° F., it is easily seen that, when the wire contracts upon cooling, it will produce a tightly wound coil.

Holding the Garage Door Open

Open garage doors are likely to be slammed shut by a slight breeze. This is very annoying, especially when one person, unaided, is attempting to drive into the garage. The simple stops shown in the drawing will prevent this occurrence. Each consists of a stout wooden prop, of 1 by 2-in. material, a leather strap, nailed to the door, and a cleat nailed below the strap. In use, the prop is set under the cleat so that pressure applied to the other side of the door cannot close it. When the doors are closed the ends of the props



Method of Keeping Garage Doors from Closing, Which Proves of Considerable Assistance When Driving into the Garage Unaided

are set behind brackets provided for this purpose; or simply rested on the frame.

Lubricating Windows

When windows fit tightly so that it is difficult to open and close them, the guide strips are usually planed down. This method of overcoming the difficulty is effective but has the disadvantage of allowing the window to rattle during windy weather, and is therefore not entirely satisfactory. A better method is to use a suitable lubricant on the guides. Not every kind of oil can be used for this purpose, however, as some kinds become thick and sticky, and this tends to increase the difficulty instead of lessening it. An excellent solution for the purpose is a mixture of paraffin and turpentine.

Dissolve as much paraffin in turpentine as possible, by shaving the paraffin and allowing the mixture to stand for a few days. Apply the solution liberally to the window guides with a brush, going over them two or three times. The turpentine will evaporate and leave a colorless film of paraffin on the guides. After this treatment the windows will slide freely, regardless of weather conditions.

For metal-frame windows in industrial and office buildings, the following method gives satisfaction: The paraffin is melted and powdered graphite is stirred into it while hot. Upon cooling, the mixture solidifies, and the cake thus formed is used to rub the guides.

Obtaining Clear Image in Finder

When exposures are made under the open sky, the finders on many cameras show not only the image of the object to be photographed, but also reflect a transparent image of the photographer's head and a section of the sky above, both of which disturb the sharp outlines of the image. Pulling down the hood of the finder low enough to cut out these reflections usually hides from view the top of the image.

A simple means of correcting this fault, and, at the same time, leaving the whole image visible, is to place a small paper cone over the finder; a piece of heavy paper rolled into conical shape, and pinned together, will serve excellently. A convenient size of cone is about 6 in. long, with the top opening ¾ in. in diameter, and the bottom opening just large enough to fit over the finder.

Garden Hedges from Sod

It usually takes considerable time and care to grow a neat-looking border hedge, and this deters many gardeners from planting them. The gardeners of Exposition Park, Los Angeles, however, have found a quick method of making them, by using sod.

Left: A Garden Well Surrounded by a Hedge Made of Sod. Right: A Bridge of Sod Built over a Miniature Lagoon

The illustrations show the pleasing effect of sod hedges surrounding a rustic well curb, and also forming a bridge over a miniature lagoon. Strips of sod are piled, one upon another, to the height and shape desired, and kept thoroughly soaked until a compact structure is formed. Sod with the grass side out is used on the edges, as well as in the topmost layer. In making structures like the bridge, it is, of course, necessary to provide reinforcement of some kind, usually heavy-wire mesh.—C. C. Wagner, Los Angeles, Calif.

Simple Blow-Out Shoe

A strip of canvas, properly applied, makes an ideal blow-out shoe that will add many miles of service to an old casing. The canvas strip must, of course, be wider than the length of the hole in the casing. The canvas is wrapped around the tube several times, so that it will fit exactly inside of the casing. A liberal application of soapstone will eliminate most of the danger of chafing. Care must be taken when replacing the tube to get it in the casing so that the bandage fits inside of the blow-out. It will be found that the casing will not bulge as with an ordinary blow-out shoe, and that the strip will last a long time.

MAKING ARTIFICIAL FLOWERS

By Bertha Graves Morey

Awarded First Prize—$100—in Contest on Occupations for Shut-Ins

DECORATIVE artificial flowers are used for so many purposes, and in such vast quantities, that some understanding of their construction will prove very valuable to the shut-in; by applying the principles laid down and illustrated in this article, he can build up a steady and lucrative business, and one that is not affected, to any great extent, by the season, as are many other lines of home employment.

In designing or making flowers for the trade, the prevailing styles should be followed, as any undue originality may lead to poor sales. The styles for flowers used for millinery are usually limited as to size and to color. If large flowers are the fashion, the size is more important than the kind, and the flowers must always be of the fashionable color. The same applies to smaller flowers. These are usually used in wreaths and bunches, and sometimes for completely covering hat crowns. Whatever sizes the ruling fashion dictates, it is best to follow nature somewhat in the selection, and to make small flowers like some natural small flower.

The quality of the material of which the flowers are made should be in harmony with the thing they are to decorate. When used for the stage, they should be of fine color, of effective size, and of any kind of material that is inexpensive and will produce the desired result. Useful materials include colored linings, muslins, cotton flannels, and organdies. For pageantry and outdoor decorations, waterproof glue should be used, and these flowers, which are usually of greater size than for other purposes, should be made of sturdy materials, to withstand careless handling.

Those used for gowns and millinery are applied to new uses, and change in style each season. These flowers are made of an unlimited number of kinds of material, from the richest to the commonest. Cloth of gold and silver, velvets, ribbons, brocades, silks, satins, laces, nets, beads, feathers, and covered wires make up the richer flowers used in millinery.

Natural grasses, seeds, pods, husks, raffia, reeds, paper, twine, leather, oilcloth, sheet rubber, tinted and painted with oil colors, yarns, chenille, and braids make up a not less interesting group of flowers for millinery, fancy dress, fancy work; decorations for cars, display windows, parades, and interior decoration for stores and homes. A touch of bright color is an acknowledged necessity, in attracting and pleasing the modern eye.

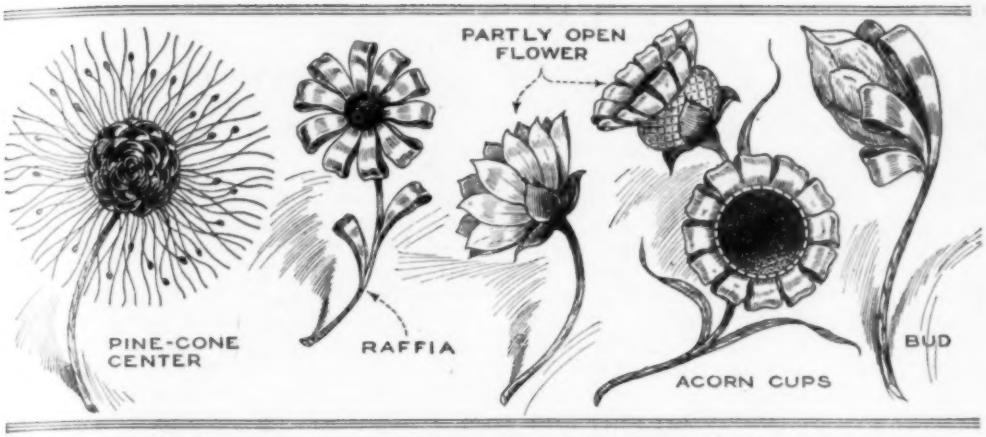
The materials needed for assembling the parts of the flowers are waterproof glue; coarse and fine wire; covered wire; cords; sealing waxes of all colors, for touches of color in the flower centers, and for sealing places hard to glue; mending tissue for covering stems and buds, and oil and water colors for details and accents.

The tools used are shears, wire cutters, sharp knives, brushes, an alcohol lamp for melting sealing wax, and an atomizer for blowing tints of color over the finished flower.

The decorative flower, to be effective, need not be a copy of nature. If a great number of flowers are to be made at one time, work can be saved by first preparing all the parts and then doing the assembling. It is sometimes best to have certain persons do the preparing, and others, possibly more fitted, the assembling. The plan of work should always be carefully laid out, and the parts put in trays or box lids.

Flowers of two or more shades or materials are more interesting and quite as easily made as those in one tone or material.

Each material has its limitations and possibilities. Woven materials, that fray easily, cannot be handled in the same manner as leather, paper, oilcloth, etc., that do not fray. Machine hemstitching offers the most professional finish for the edges of petals made from fraying materials. Pile materials, such as velvet and plush, lose much of their fraying qualities if painted over the back with a thin-glue size. This size should be thick enough to stay on the surface, and not soak through the pile. Several applications, each to be dried before the next is applied, will be necessary if the



Left: Flower with Pine-Cone Center, Pine-Needle Petals, and Wax-Tipped Pine-Needle Stamens. Center: Various Flowers, Using Ribbon-Loop and Cut-Out Petals, and Two with Painted Acorn Cups as Centers. Right: Bud, of Satin, Metal-Cloth, or Silk-Covered Satin, with Ribbon Calyx and Stem

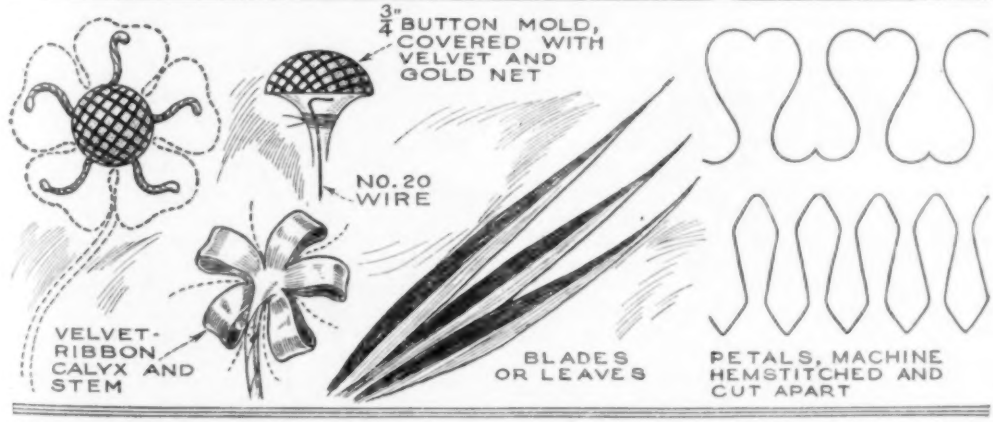
material is to be quite stiff. Nets, mulls, and thin silks may be stiffened by dipping in a very thin size. To do this, the material is dipped, then dried in a small frame, made in the same manner as an ordinary curtain stretcher. Cotton materials may be starched to almost any degree of stiffness and either stretched, as mentioned above, or ironed. Stretching is by far the most successful way of drying, but is not always practicable, if small pieces or scraps of material are being used.

The parts of all flowers are about the same, and the different development of these parts will be better understood if natural flowers are taken apart and carefully studied. From this study many ideas for the shapes to use for petals and leaves will be discovered. A notebook of sketches of the parts of dissected flowers will prove an invaluable addition to the flower maker's equipment.

For the artificial-flower maker's purposes, the flower consists of three parts: the center, the petal or petals, and the calyx. The center is made up of stamens and pistils; the petals, known botanically as the corolla, may consist of one funnel-shaped unit, as in the petunia, or of many petals, as in a rose; the calyx, consisting of the sepals, is the cuplike formation that grows from the stem and surrounds the petals and center, all forming the flower.

Centers in decorative artificial flowers, as in nature, form a distinctive note that should be well developed with the proper color harmony in relation to the other parts. The centers for silk, feather, metal-cloth, and lace flowers should be of rich material, to harmonize with the material used in the petals.

To make the centers, buttons, covered with material embroidered with silk or metal threads, are used, or small skeins


3/4" BUTTON MOLD, COVERED WITH VELVET AND GOLD NET
NO. 20 WIRE
VELVET-RIBBON CALYX AND STEM
BLADES OR LEAVES
PETALS, MACHINE HEMSTITCHED AND CUT APART

Left: Flower with Velvet-Ribbon Calyx and Stem. Center: Center Made of Velvet and Gold-Net-Covered Button, and Shape of Artificial Leaves. Right: Method of Cutting Petal Material, After Hemstitching, to Avoid Waste

of thread, tied or wired, and clipped to form short, stubby, brushlike parts, which are touched with colored sealing wax, or oil paint, to make them bright. Buttons, covered with long-nap velvet, and then covered with silk or metal net, also make good centers, the pile of the velvet standing up through the meshes of the net. Beaded velvet centers may be used for silk flowers; feather centers for ribbon and silk flowers, or small clipped feather centers for flowers of soft feather petals. Twine, fiber, raffia, tight little rolls of paper, muslin and crash, and crochet wool, cotton, or linen yarn, are suitable materials for the centers of paper and oilcloth flowers.

The stamens, while frequently omitted from the artificial flower, are an attractive addition, and well worth the extra work. Short or long pieces of fairly stiff cords, raffia, threads, or grasses with ends knotted, beaded, dipped in sealing wax, or touched with oil paint, make suitable stamens. The color used on these should harmonize closely with the other parts of the flower, or contrast strongly, while preserving the color scheme. If small loops are used for stamens and large ones for petals, the stamens are made of material that will enable them to be distinguished easily from the petals. Loops of fine wire, strung with small beads, make sparkling stamens, appropriate for flowers used for millinery and dress decoration.

The petals permit the greatest variety of shape in designing decorative flowers. They are made in loops, fringes, or solid pieces, carefully yet seemingly carelessly shaped, of one or of many pieces. The one-piece petal such as would be used for the calla lily, the petunia, etc., is not very interesting in artificial flowers, and is more easily made of crêpe paper than of woven material. When made of woven material, it is necessary to use wooden or metal forms where the dampened material is pressed and stretched until dry. Any necessary seams or laps are glued with waterproof glue. The edges are trimmed when perfectly dry, and any tinting necessary is done with an air brush. While it is interesting to know something of how the one-piece petal is made, the result is not worth the extra equipment.

The many-piece corolla or petals are much more interesting, effective, and simpler to make. The shape and color may follow the natural flowers or the maker's own taste. Flower design, like all other designs, follows lines and ideas not always found in nature. However, there is much to learn from nature, and artificial flowers made following nature's own design and color are always interesting.

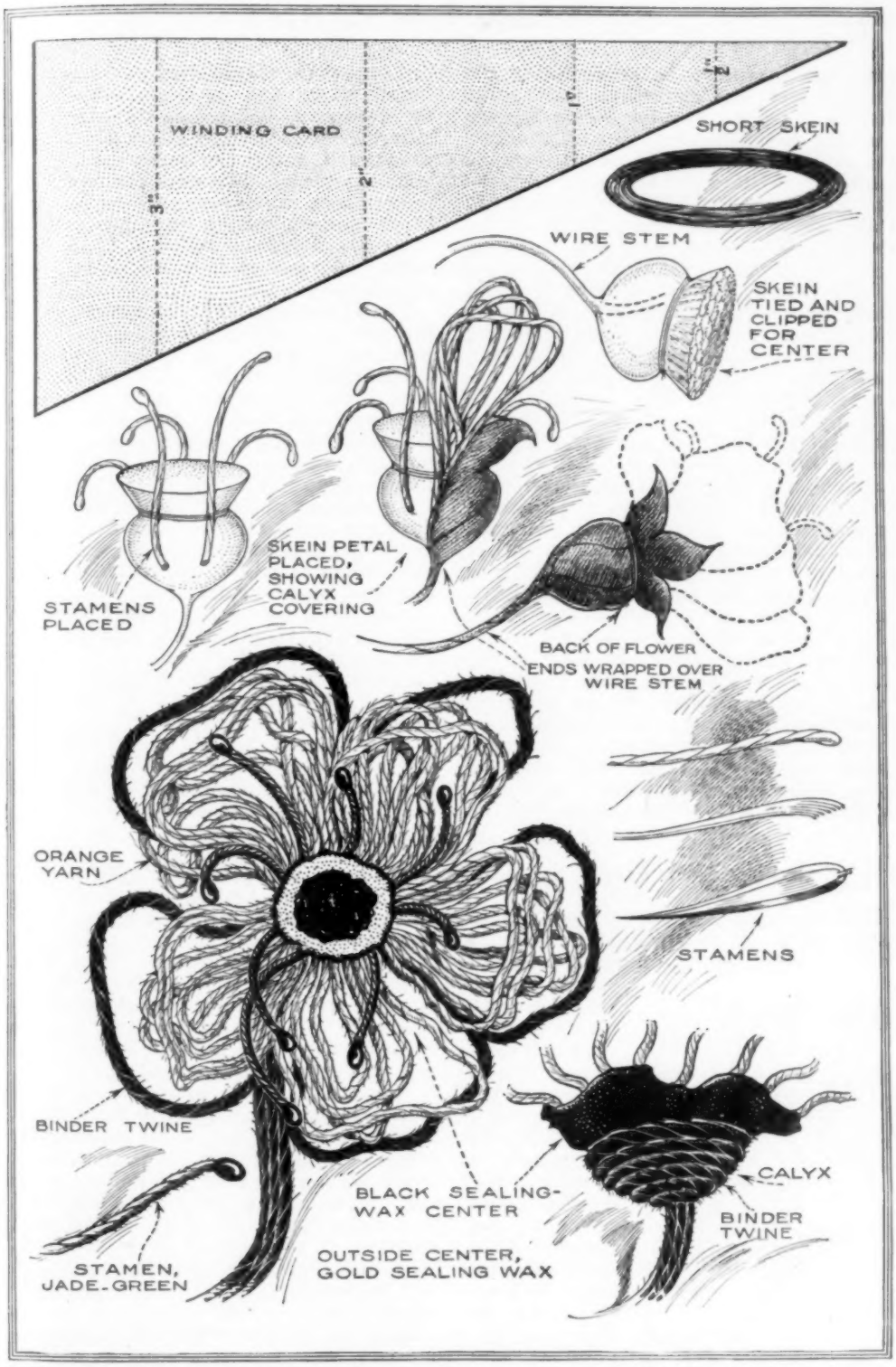
For materials that ravel, machine hemstitching or picoting makes a substantial and interesting petal edge. The petals may be so designed as to make one line of hemstitching finish two sets of petals, leaves, or blades, as shown in one of the drawings. Coarse or fine buttonholing is also a useful petal edging.

The calyx is an excellent place to finish the flower. Broad strips of raffia, mending tissue, ribbon, strips of the same kind of material as that used for the petals, tape, or oilcloth are cut to shape at the ends, and wound over the base of the flower and down the stem. These strips, if of mending tissue, will stick from the warmth of the hand if held in place for a moment. If the covering is of any other material, glue or sewing, or both, must be used. Should the material stain with glue, fasten it in place with as few stitches as will do the work. Avoid overworking the parts of a flower, as this will make them clumsy and ugly.

The leaves may be seemingly real flat leaves, twists, spikes, or loops of suitable color to simulate the desired foliage. For flat leaves, imitating natural leaves, patterns are made, and the leaves cut from sized or starched material and glued to a thin-wire stem, which also forms the central vein of the leaf. When complete, if very glossy foliage is wanted, paint the leaves and stems with shellac, or dip them.

Buds are made of small balls or forms of cotton, covered with green, or a darker color than that used for the flower. The calyx and stem are finished in the same manner as the flower.

When assembling the parts, the center is first made by winding a skein on the winding card shown at the top of the large illustration. The ends of the skein are tied; it is then removed, doubled several times, and tied with several turns of No. 26 iron wire, and the ends clipped, so that the center assumes the shape shown at the upper right. The stamens are placed around the center and secured with fine wire also. The petals are next placed in position and wound as firmly as possible. If there are several rows of petals, use only one or two windings of the wire for the first rows and the heaviest winding for the last row. This stub is then wound with heavier wire, No. 22 for average work, and this wire extended down for the stem, although



Details of the Making of an Artificial Flower with Skein Center, Sealing-Wax-Tipped Stamens, Loop or Skein Petals, and Either Binder-Twine or Strip Calyx: The Winding Card Shown Is for the Purpose of Making Uniform Skeins for Centers or Petals. Several Types of Stamens are Also Shown. The Color Scheme Indicated is Suggested Only, and may be Modified to Suit

the stem may also be stuck inside the skein center; the method of making the stem will depend, to a large extent, upon the type of center used. Before covering the stem, any buds to be used must be added by twisting the bud stem with the flower stem. The calyx is then made and glued, or sewn, firmly in place, the stem wire covered, and the covering glued or sewn.

The foliage used with flowers should harmonize with the color of the flowers, as yellowish-green for yellow flowers; gray or purplish-green for red flowers, blue-green for blue flowers, and gray-green for pink and violet flowers.

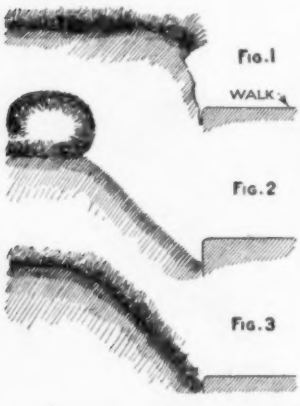
Many natural grasses and seeds are used in millinery. If the natural color is not desired, aniline dyes, soluble in alcohol, are used to dye the grasses. Several dippings, drying between successive ones, will be needed for very dark colors. Water colors may be used, but the water sometimes softens the grass, causing it to lose its shape. Alcohol dries very quickly, and does not soften the stems or grass. When dyeing with either water or alcohol dyes, always dry by hanging up by the stems. If it is necessary to stiffen the plants, use alcohol that has absorbed as much white shellac as it will take, and then add the dye and dip until the proper shade is reached. The seeds may be dyed, shellacked, or painted with glossy or flat-color oil paints. Seeds may be drilled and wired and used in the centers. Small husks and seed pods are used for decorative flowers, sometimes in the natural color, but most frequently dyed or painted, using the same methods as with the seeds. The stem parts of clove seeds make interesting centers for very small flowers. Palm-leaf fans, cut in crosswise strips and rolled in ¾-in. rolls, make good centers for stiff flowers, such as zinnias.

The vogue for winter bouquets permits the use not only of natural flowers, but everlasting ones, such as straw flowers, bachelor's-buttons, lily pods, chinese-lantern pods, rose hips, pampas grass, and the countless reeds. Dry corn husks make very lovely delicate-colored petals, but are not durable and will not stand much shaking or handling.

To market the product, a line of a dozen or more samples should be made, and either sent or taken to the merchant, and orders solicited, the material to be delivered at a certain time. The price should bear some relation to flowers on the market of the same quality. The time spent cannot be calculated at the same rate for work done by an invalid as that of the work done by the able-bodied. The selling price should be 33⅓ to 40 per cent below the merchant's selling price. Some workers mark their goods at the retail price, less either of the above-mentioned discounts.

Grading Lawn Frontage

It frequently happens that grades for public walks are established after houses have been built on the adjoining lots, and as these grades are very often lower than the surface of the lots, it becomes necessary for the owners to slope the frontage, and make a neat bank. This is usually done by cutting the ridge down and reseeding the bare soil. During this process much trouble is experienced from rain, as it washes both seed and soil away. To prevent this, a workman employed a practical method in making the bank, that left it very neat in form and grassed over in perfect condition.



The level of the walk was about 20 in. below the surface of the lawn and presented a very rough appearance, as shown in Fig. 1. The sod was loosened, cut into strips by means of a spade, rolled back, and the soil graded, as shown in Fig. 2. Before the sod strips were rolled back over the bare soil, as shown in Fig. 3, both sod and soil were thoroughly sprayed with water until saturated, which helped to keep the sod in place and prevented the grass from withering before the roots took hold. Subsequent watering, at intervals of 24 to 48 hours, for a few weeks, left the lawn frontage in as perfect condition as before the bank was formed.

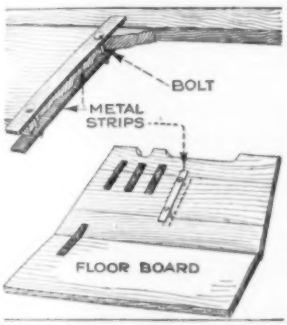
Neighboring lots, where the slope was cut away in the usual manner by cutting and reseeding, did not attain a presentable appearance for over a year, and some were badly damaged by rain.

Emergency Gaskets for Automobile

When it is necessary to use a gasket for an oil leak in the transmission cover, and a regular gasket is not at hand, a good one may be made from a piece of heavy wrapping paper. The sheet is laid over the cover and cut to fit by tapping around the edges with a hammer. The bolt holes are cut with the ball end of the hammer. The same kind of gasket will serve in many other places.

Keeping Floor Boards in Place

After a light car has been in use for some time, it frequently happens that the foot boards do not fit as snugly as at first, and hence are apt to slip out of place. This might cause a serious mishap, if it should occur while driving, as the pedals would be locked. One way of eliminating this danger is to bolt two metal strips to opposite sides of the middle floor board, as shown in the illustration. The ends are allowed to project ¼ or ½ in. beyond the edge of the floor board. It has been found that the boards will never slip out of place with this arrangement, but can still be removed and replaced easily.—W. J. Fraser, Toronto, Canada.

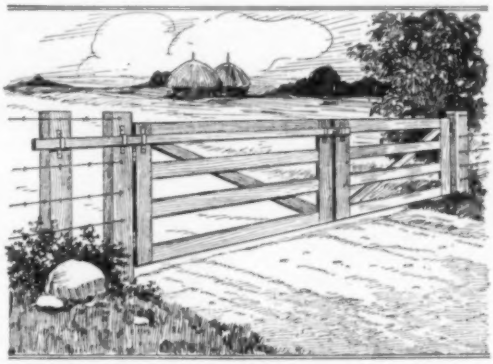


Double Gate for Farmyard

A gate of double width is a special convenience in the farmyard to permit the easy passage of wide hayracks, loaders, harrows, and other large implements. Such a gate is shown in the illustration, and it has the additional advantage of being made without the usual center post, to which both parts of a double gate are latched, and which is objectionable because it partly defeats the purpose of such a gate.

The gate illustrated is strong and rigid. The fence on one side of it is provided with two posts upon which are mounted U-brackets made of flat iron or steel. These are in line with similar brackets on the gate, as shown, and together accommodate a 2 by 4-in. beam. A hole, drilled near the end of the beam, permits the insertion of a peg or bolt to be used for a handle.

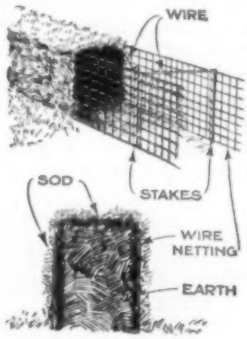
Generally, it is only necessary to open one section of the gate to provide sufficient space for the passage of an automobile or carriage. The side of the gate shown at the right is opened by simply pushing the 2 by 4-in. beam back a few inches to clear the bracket. The beam remains in the four brackets of the other section and posts, and holds the rest of the gate rigidly in place. When necessary to open both sections, the right one is released first, and then the beam is pulled out of the two post brackets, which allows the left section to swing freely on its hinges.



A Double Gate for the Farmyard, Constructed So as to Eliminate the Objectionable Center Post of the Usual Double Gates

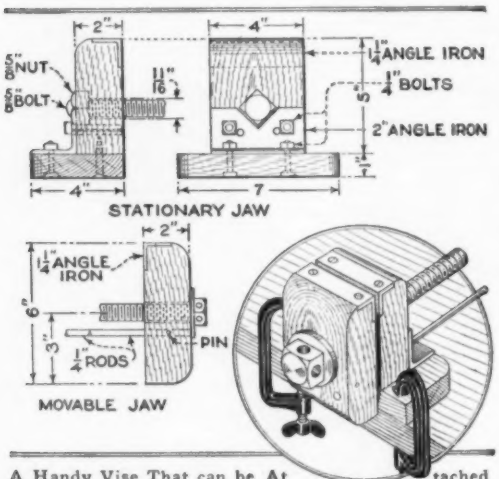
A Neat and Simple Hedge

A very neat hedge can be made without the trouble and expense of setting out separate shrubs and then having to keep them trimmed. A frame of wire screen or netting is set up in the manner indicated by the drawing. Sod is placed inside the wires, with the grass side out, and the space between is filled with earth. In a short while the grass will grow through the mesh of the screen and completely conceal it. The same idea can be followed out by planting some rapid-growing climbing vines over the netting.—Robt. Page Lincoln, Minneapolis, Minn.



A Homemade Vise

A homemade vise that can be clamped to any table or bench proves of considerable assistance where space does not permit the use of a stationary vise, or where a vise is used so seldom that it is hardly advisable to purchase one.



A Handy Vise That can be Attached to Any Table or Bench with Ordinary C-Clamps: It is Made of Hardwood and the Jaws are Protected with Angle Iron

The base and jaws are made of hardwood, to the dimensions shown. A piece of 2-in. angle iron holds the stationary jaw to the base, and is attached to both with ¼-in. bolts. To face the jaws, 1¼-in. angle iron is used. A hole is drilled through the center of both jaws for the ⅝-in. bolt, used as a screw, and a ⅝-in. nut is recessed into the back of the stationary jaw. If desired, small holes can be drilled through the head of the bolt to accommodate a "tommy," so that it will not be necessary to use a wrench for tightening or loosening the vise; or a permanent lever may be attached to the bolt head as in an ordinary vise. C-clamps are used to fasten the vise to the table or bench.

Disinfecting Cellars

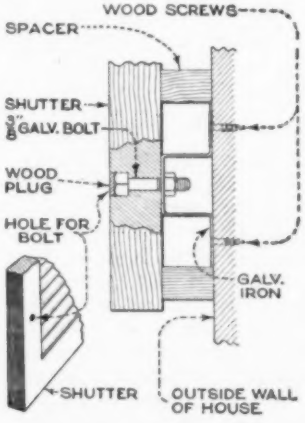
It is very disagreeable to have the basement or cellar acquire a musty odor after being closed up all winter. To prevent this, clean the basement thoroughly, taking care that there is no decaying vegetable matter in it. Then sprinkle dry chloride of lime, pulverized copperas, or even common lime on the floor, and close the basement up. After a few days, open the windows until the smell of the lime disappears. If the musty smell still persists, whitewash the walls and sprinkle powdered charcoal around freely.

It is a good plan to whitewash the cellar walls twice every year, in the spring and in the fall. This will not only improve the appearance but will also help to keep the air from becoming foul. As everyone does not know how to make a good whitewash that will not rub off on the clothes, the following recipes and information will be of value. Procure some hydrated lime, which can usually be purchased at a builder's-supply yard. Add enough of it to half a pailful of water until the mixture, which is, of course, stirred continuously, acquires a creamy consistency. Take ¼ lb. of flour and mix it in a separate dish, using enough water to barely wet it. Rub all lumps out with a tablespoon. Then pour boiling water on it to thicken it, and pour it into the whitewash, stirring well.

Another method of making a good whitewash consists in adding 2 lb. of salt to every 10 gal. of water, stirring well until the salt is dissolved; and then adding hydrated lime until the mixture has the consistency of paint.

Fasteners for Colonial-Window Shutters

The window shutters on present-day houses of the colonial type are fitted more for ornament than for use, and since they are not opened or closed, the type of fixture shown should be used for fastening the shutter to the side of the house.



This fixture has several advantages. It is nearly invisible, holds the shutter securely, and can be detached in a few moments, when it is necessary to clean or paint behind the shutter. A small U-shaped, galvanized-iron bracket is attached to the siding with wood screws, in line with the edge of the shutter. The latter is attached to the bracket by means of a machine bolt, as shown, and the head of the bolt is countersunk and covered with a wooden plug.—L. H. Georger, Buffalo, New York.

Removing and Replacing Valve Springs

Although the grinding of valves on automobile engines is a simple operation, according to most instruction books, the amateur mechanic faces several difficulties, especially in case of an L or a T-type of cylinder head. Very often the whole side of the cylinder block is inaccessible; the valve spring cannot be lifted without the aid of a compressing lever, and the pin under the spring is difficult to get at, and often falls down into the oil pan while one is attempting to get hold of it. The use of a few simple tools, however, makes the job comparatively easy.

A satisfactory compressing lever that can easily be made is shown in Figs. 1 and 2. The lifter consists of two short lengths of flat steel, connected with a short bolt so that the tool can be folded, to save space in the tool compartment. An iron or hardwood block is used as a fulcrum. By resting the fulcrum on the crankcase, near the row of valve tappets, and inserting the forked end of the lever under the valve spring, the latter can be pried up far enough to expose the pin.

After raising the valve spring, the pin must be removed. This is usually done by means of a pair of tapered-nose pliers, as shown in Fig. 4. However, an electromagnet, made as shown in Fig. 3, has been found to give great satisfaction. The core of this magnet, which is made of soft iron, extends 1½ in. beyond the bobbin; it is bent and tapered at the end as shown. The bobbin is wound with several layers of No. 14 single cotton-covered magnet wire. The ends of the coil are soldered to flexible cord that can be led to the terminals of a storage battery, or provided with a plug to fit into the dash lamp or other socket. Such a magnet will remove and replace pins with very little danger of dropping them.

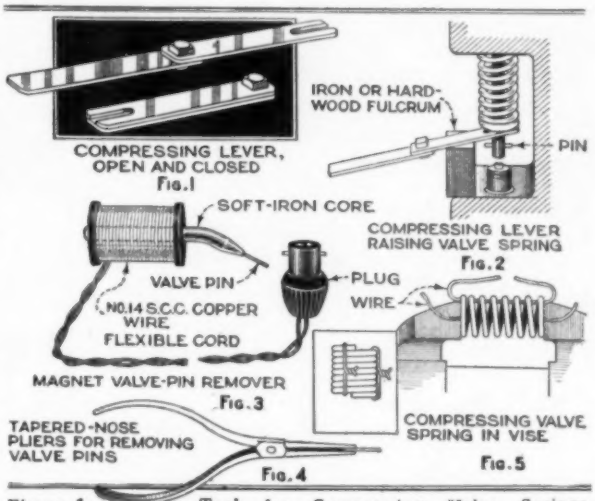


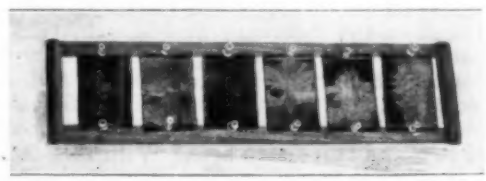
Figure 1: Tool for Compressing Valve Springs. **Figure 2:** Method of Using. **Figure 3:** Homemade Electromagnet Used to Extract Pins. **Figure 4:** Tapered-Nose Pliers for Extracting Pins. **Figure 5:** Method of Holding Springs Compressed

It is usually an easy matter to remove the valve springs, but very difficult to compress them and to put them into place again. A simple method is shown in Fig. 5. The spring is compressed in a vise, and some No. 20 wire tied around it, as indicated, to hold it together after the vise has been released. While held in this way, the spring is set in position around the valve stem, and the washer and the pin are replaced. The tie wires are then cut.—H. H. Parker, Oakland, Calif.

Film-Developing Rack

A convenient and inexpensive frame to facilitate the handling of film-pack films, while developing, is shown in the photo.

The frame is made of wooden strips, the length and width of which are determined by the size of the films and the number to be developed at the same time. The films are fastened to the sides of the frame with glass-headed push pins, as indicated, and the frame, with the films attached, is then immersed in the developer bath and fixing solution in turn. The use of such a frame permits each negative to be watched separately, and overexposed negatives can be removed before the others. After the films have been thoroughly fixed and washed, the frame is placed in a suitable place to allow the films to dry, and thus the separate films need only be handled once or twice at any time.



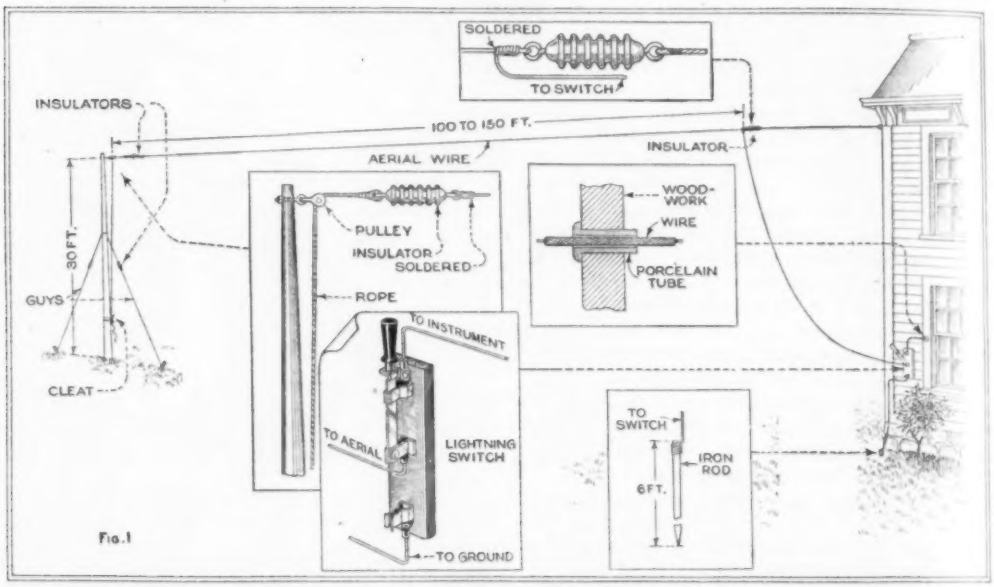
A Frame for Facilitating the Development of Film-Pack Films: The Negatives can be Watched Separately and Any One can be Removed before the Rest

Installing Radio Apparatus on the Farm

By E. R. HAAN

THE large number of stations now broadcasting weather and market reports make the installation of a radio-receiving instrument on the farm no longer a luxury, but a necessity.

The operation of a receiving set is very simple; no technical knowledge is necessary, and any farmer may, in a very short time, become expert in "tuning in" the various stations within the range of his set.



The Single-Wire Aerial Is the Most Commonly Used, and has been Found to Be Universally Successful. Its Length Is from 100 to 150 Feet, and It is Suspended at a Height of 30 to 60 Feet above the Ground. The Illustration Shows All the Details of Installation and the Necessary Connections

A receiving set can be either built at home or purchased ready-made. There are today thousands of boys on the farm who have built and are building radio-receiving sets. For those who contemplate building their own sets, complete information on the construction of a successful receiving set that has a distance range of approximately 1,000 miles, and a wave-length range of 150 to 400 meters, is contained in the February and March, 1923, issues of this magazine. The February issue describes the construction of a detector unit with one stage of amplification; the March issue, the construction of two and three-step sets. With this set it is possible to receive the popular entertainments and lectures broadcast at wave-lengths up to 400 meters, but not the official weather forecasts, and crop-and-market reports that are broadcast at a 485-meter wave length. However, the reception of the latter is made possible by using 21 turns of wire instead of the 16 indicated in the circuit diagram of the outer coil, making a total of 45 turns instead of 40. No. 28 single silk-covered wire should be used instead of the No. 26 double cotton-covered wire specified, to enable the extra turns to be wound on the form. This is the only change necessary, and will readily be understood upon referring to the articles mentioned. The set can be used successfully to operate a regular loud-speaking horn or can be hooked up with a phonograph horn to amplify the sound. Under especially favorable atmospheric conditions the distance range is often much greater than 1,000 miles.

If a ready-made receiving set is to be purchased, a few considerations must be borne in mind: It is highly advisable for a farmer to have a two-stage set with which he can receive the 485-meter reports. Never purchase a set on the assumption, or on the verbal assurance that it is suitable for receiving market reports; insist that the dealer demonstrate this capacity of the set by actually "bringing in" these reports.

Anyone can install a receiving set. Procure a 100-ft. or 150-ft. length of No. 12 or 14 stranded copper wire, which is best for strength and conductivity. If this

cannot be obtained, any bare copper wire, No. 12 or 14, but not smaller, will do. Also procure two aerial insulators; some No. 14 insulated weatherproof wire for a "lead-in," the length of which depends on the height of the aerial; a lightning switch, for which a single-pole double-throw knife switch of 600-volt, 100-amp. capacity is suitable; a number of porcelain knobs, and two porcelain tubes. With this material proceed to erect the aerial, as shown in Fig. 1. In selecting a suitable place to suspend the aerial, the following precautions must be taken, the neglect of which will result in inefficiency of the set. Suspend the aerial 30 to 60 ft. above the ground, so that there will be a considerable space between it and any trees, structures, or outbuildings. In case electric-power, light, or telephone lines run near or through the farmyard, take care to suspend the aerial at right angles to and not parallel to these lines. If possible suspend the aerial from masts mounted on the house and barn or other building. The lead-in wire must always be fastened to the house end. Full details of the method of attaching the wire to the mast are shown in the illustration.

The lead-in wire is attached to one end of the aerial and is brought down to the lightning switch; it is either allowed to hang from the aerial to the switch as indicated, or if desired, may be attached to the side of the house at different points with porcelain knobs. Care must be taken to solder all the connections, in order to make them mechanically and electrically secure. The insulation of the lead-in wire must be kept intact at all points to prevent any possible ground. The lightning switch is attached on the outside of the house near the window where the wire to the instrument is brought in; the latter is insulated by means of a porcelain tube where it passes through the window casing or frame. The lead-in wire from the aerial is soldered to the center terminal of the switch; the wire to the instrument to the upper-clip terminal, and the ground wire to the lower-clip terminal.

There are numerous other types of aerials that give good results. Frequently two or four-wire aerials are used. There are cage, umbrella, fan, and loop aerials, the latter for inside use. There are also several methods of connecting the lead-in to the aerial. But it is not the purpose of this article to give the construction of various types, their merits and demerits; the single-wire aerial described above has been found universally successful, and, being simple to make, is particularly recommended. However, if it is desired to have a two or four-wire aerial, the aerial wires and guy wires are attached to a wooden spreader, as shown in Fig. 8; the aerial wires are 100 ft. long, and are spaced 2 ft. apart.

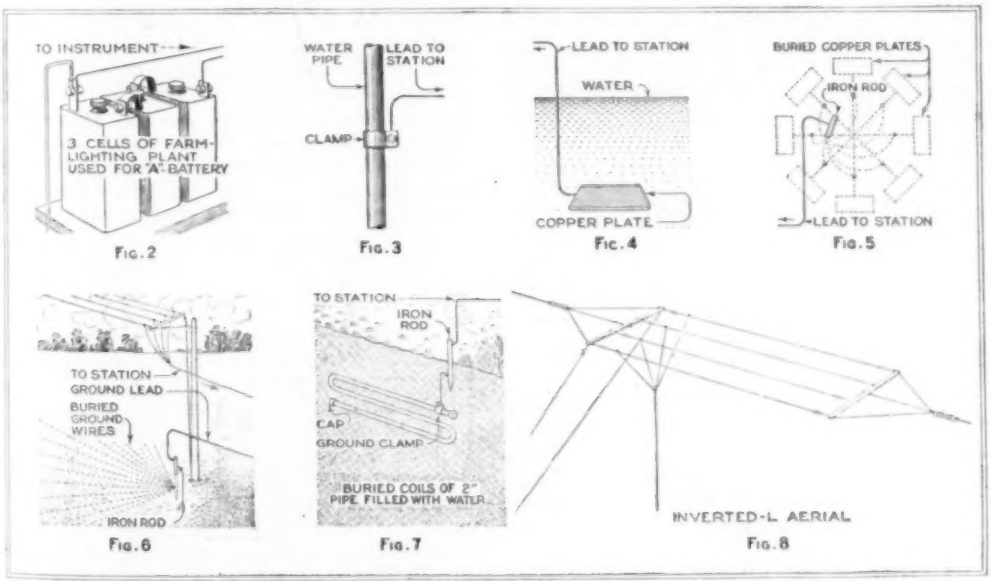


Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6 Fig. 7 Fig. 8

Figure 1, Three Cells of a Farm-Lighting Outfit Used for A-Battery; Figure 2, Method of Grounding on Water Pipe; Figure 3, Grounding in a Well; Figures 4, 5, and 6, Other Methods of Grounding; Figure 7, a Four-Wire Aerial That is Used Quite Often. The Wires are Spaced About Two Feet Apart, on Wooden Spreaders, Which are Braced by Insulated Wires or Ropes

The ground connection must now be made. This is another important part of the installation. The object is to make a good connection between the ground terminal of the switch and the earth. Drive a long steel or iron rod into the ground, to a depth of about 5 or 6 ft., and solder the ground wire to it securely. Another excellent method of grounding is to solder the ground wire to a copper plate and to drop this plate into a well, as shown in Fig. 4. Other methods of grounding are shown in Figs. 5, 6, and 7. The ground wire need not be insulated, but it must be well separated from the lead-in wire so that there can be no possible connection between the two. The connection shown in Fig. 2 is quite suitable for the ground connection from the instrument—not the switch—and is simply made. Run a length of lamp cord, or similar heavy wire, to the nearest water pipe. Scrape the pipe bright and attach the bared end of the wire to it by means of a clamp, or by soldering directly to the pipe. Be sure to make a good connection between wire and pipe.

In maintaining the set, the following hints should be kept in mind: Never allow the storage battery to run low before it is recharged, as this lowers the efficiency of the set, and is bad for the storage battery itself; on a farm having an electric-lighting outfit, it is not at all necessary to have a separate storage battery for the radio set, because three cells of the lighting battery, connected as in Fig. 2, will do just as well. In fact, using three cells of the lighting battery is even better than having a separate A-battery, because the lighting battery is always kept charged, and hence does not involve so much trouble as a separate storage battery.

The B-battery should be tested occasionally for voltage. This can easily be done by means of an 18 to 24-volt automobile-headlight lamp; its two terminals are touched, for a moment only, to the two leads connected to opposite poles of each 22-volt unit. If it burns very dimly, the battery is weak, and should be replaced with a new one. It usually takes quite a while before the B-battery is exhausted, and one is therefore apt to forget about it and wonder why the set does not work as well as it did at first.

There are several kinds of detector and amplifier tubes at various prices on the market. In selecting these, it is best to get a good tube manufactured by a reputable concern. However, the difference in the results obtained from two tubes having the same rating, and made by the same concern, is sometimes surprising. Before purchasing any tube one should always insist upon having it tested, as it frequently occurs that tubes do not work properly, due to causes and conditions in their manufacture beyond control.

By carefully following the method of installing the aerial and ground, and observing the suggestions for maintenance contained in this article, any farmer can successfully "listen in" to lectures and entertainments, to weather forecasts, and crop and market reports, that are broadcast daily from scores of stations all over the country.

In receiving market reports, it is, of course, necessary to note them down carefully so that the reports from various stations can be compared. It will be found that it is very convenient to have a blackboard mounted on the wall near the set, so that the items and figures can be jotted down as they are received. The board should be arranged so that the reports of several successive days can be noted, as this helps to show the trend of the market. No particular arrangement of this bulletin board is shown, as the subjects listed will depend upon the particular interest of the farmer, and will vary in nearly every case.

Irrigating the Garden

It is common during the summer dry spell to see amateur gardeners spending an hour every evening in sprinkling their gardens. While this undoubtedly refreshes the plants, it does not saturate the ground to a sufficient depth to benefit the plant roots.

A much better method, and one that does not require as much time and labor, is to remove the nozzle from the hose and allow the full stream to flow into the garden. The stream should be directed into the rows by means of small ditches, in the same manner as irrigation is practiced in dry climates. By saturating the soil to a depth of 4 or 5 in., sufficient moisture is provided to last for several days or a week. The soil should, of course, be cultivated as usual.

One should never sprinkle a garden during the day when the sun is shining, as this practice is very injurious to the plants and flowers.—G. E. Hendrickson, Argyle, Wis.

A Fireproof Cement

An excellent fireproof cement for furnace and stove work can be made by mixing powdered fire clay with sodium silicate (water glass) to the consistency of a stiff dough. Powdered magnesia or asbestos can also be used instead of fire clay, but the latter is usually the easiest to obtain. A small quantity of asbestos fiber added to the mixture will serve, like hair in plaster, to hold the cement together.

The cement thus made is not expensive and will stand considerable heat. It is very useful for plugging up smoke-pipe openings and also for lining stoves.

A Birch-Bark Berrying Basket

A simple berrying basket can easily be improvised in the woods, when a regular basket or bag is not available. Tear a strip of bark from a birch tree, and fold it over, as shown in the photo, folding in the edges at the side and bottom, and "sewing" them together with a slender flexible green twig. Attach another piece of twig to the top of the basket, to serve as a handle. This basket is quite strong, considering its rough construction, and serves very well for the purpose of carrying berries, fruits, and nuts. It can, of course, be made any size desired.

Lawn Table and Parasol

The novelty of the lawn table shown in the photograph consists in the use of a three-branched tree crotch for the legs, and also in the attachment of a large parasol to the table. To one who is fond of reading or studying in the open, this shaded table is a great convenience.

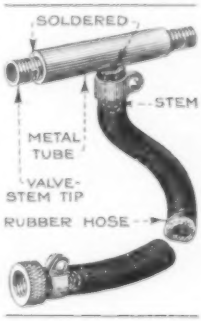
When the branches of the crotch are sawed off evenly, they provide a strong and stable support. The bark can be left on or peeled as desired. A circular table top is preferable to any other shape, and it should be a little smaller in diameter than the parasol used. The table top is mounted on a framework of 2 by 4-in. pieces, nailed to the crotch, and is preferably made of cypress, to withstand the

A Novel Lawn Table Equipped with a Large Parasol Is of Great Convenience for Those Fond of Reading or Studying Outdoors

effects of the weather. The parasol is one of extra-large size, such as used on delivery wagons, and the handle is set into a hole drilled in a wooden block screwed to the table.

Pumping Tires Quickly

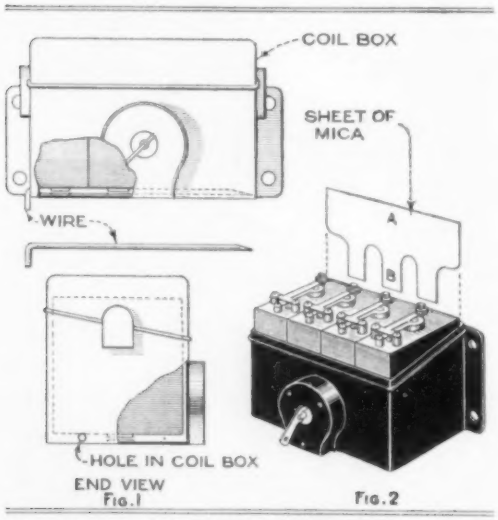
The attachment shown in the drawing permits the use of two pumps to inflate an automobile tire, and is therefore quite a timesaving addition to the motorist's tool kit, especially when the car is equipped with fairly large tires.



The device is made from a short piece of $\frac{5}{8}$-in. metal tubing, in the ends of which valve-stem tips, about $\frac{3}{4}$ in. long, are soldered. A hole is drilled in the center of the tube, another stem soldered in, and a length of pump hose clamped to it. A regular pump-hose stem, equipped with a screw-cap, is clamped in the other end of the rubber tube.—R. L. Friess, Bowling Green, Ohio.

Foiling Automobile Thieves

Automobile thieves usually do not care to spend much time in attempting to steal a light car; they take one that can be started instantly, and let the others alone. For this reason, simple methods of preventing the engine from starting are often just as good as expensive locks.



Two Methods for Foiling Automobile Thieves: Figure 1, Wire That Lifts the Coils to Separate the Bottom Contacts; Figure 2, Sheet of Mica That Separates Back Contacts.

Figure 1 shows a piece of pointed wire, about ¼ in. thick, pushed through a hole drilled in the side of the coil box, and under the coils, so that the lower contact on each box is raised and the circuit broken. It is, of course, advisable to drill the hole on the left side, so that the wire cannot be seen when the car is entered.

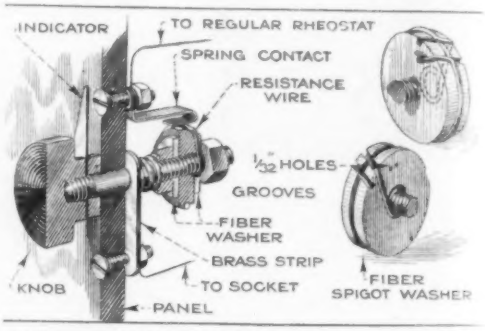
Another method of breaking the circuit is to cut a piece of mica, or any thin insulating material, to the shape shown in Fig. 2. When this is inserted behind the coils, with the end A down, the circuit is broken. With end B down, however, the circuit is complete, and the car can be started as usual, as the back terminals make contact through the cut-out portions of the mica sheet. The discovery of this device is also very improbable.

Cleaning Tarnished Silver

Tarnished silverware can be cleaned by dipping it in a solution of water, soda, and salt, contained in an aluminum pan. The pan must be clean and free from all grease, and filled with enough boiling water to cover the silverware. One teaspoonful of baking soda and another of table salt is added to each quart of water. The silverware is immersed until the tarnish has disappeared. The pieces are rinsed in clean warm water, and rubbed until dry with a soft cloth. If not tarnished very much, it is only necessary to dip the silverware in the solution, but it must come in contact with the aluminum. —Charles A. Smith, New Haven, Conn.

Easily Made "Vernier" Rheostat

A "vernier" rheostat, connected in series with the regular one, will be found of advantage when regulating the filament current in the radio detector. For receiving sets not equipped with a vernier rheostat, one can readily be improvised as illustrated. The rheostat consists of a short length of resistance wire, wound once around the circumference of a fiber spigot washer, about ⅝ in. in diameter. Grooves are cut across the washer, as shown, so that one end of the resistance wire can be wound around the threaded spindle, and locked with a nut and washer; the other end is fastened by threading it through two 1/32-in. holes, drilled about ⅛ in. apart. A spring-brass contact, bolted to the panel, bears on the wire when the assembly is mounted on the panel, and connection to the spindle is made by means of a spring-brass strip, also bolted to the panel as shown. A spring is used on the spindle, between this strip and the inner binding nut on the fiber washer. A knob and indicator are mounted on the front of the panel in the usual way. This rheostat provides a variable range of resistance, the maximum value of which is equal to that of a single turn of wire on the regular rheostat.—E. J. Bachman, Fullerton, Pa.



A Homemade "Vernier" Rheostat That can be Made by Any Amateur: Its Maximum Resistance Equals That of a Single Turn of Wire of the Regular Rheostat

PRIZE OFFERS AND ANNOUNCEMENTS

DEVICE FOR RECORDING SHAFT SIGNALS SOUGHT BY COMPANY IN TRANSVAAL

A practicable device for recording mine-shaft signals is sought by the Rand Mutual Assurance Company, which offers a prize not exceeding £250, or about $1,100, for the best submitted. It is intimated that the company may also offer to buy or lease the winning device, though competitors will be under no obligation to enter into this phase of the question.

As it would be scarcely possible for American contestants to write and receive full details of the competition in time to submit their designs before the closing date, which is September 30, of this year, the full conditions governing the contest are given herewith. They are as follows:

1, the device must be capable of being installed in existing plants at a moderate cost; 2, it must be capable of being kept in efficient working condition without undue expense; 3, if the device has been in practical use, particulars must be supplied; 4, models, drawings, plans, photographs, or other descriptions of the device must be submitted, from which a full-size working appliance is capable of being constructed. These must be accompanied by an estimate giving the approximate cost of equipping a typical engine with the device, and the royalty (if any) payable for its use if the device is patented; 5, the full name and address of each competitor must be given; also a statement as to whether the device is patented or not, and when and where a model of the invention can be seen; and 6, the Prevention of Accidents Committee reserves to itself the right to reduce or withdraw the prize money if in its opinion none of the designs submitted is considered to be sufficiently worthy.

Address J. F. Bilbrough, Managing Secretary, Rand Mutual Assurance Co., Ltd., P. O. Box 413, Johannesburg, Transvaal, South Africa.

NAME AND SLOGAN WANTED FOR HATS TO BE WORN BY MIDDLE-AGED WOMEN

A name and a slogan for a new line of hats about to be introduced are wanted by a millinery company of Chicago. Four prizes are to be given, the first $400, and the others $300, $200, and $100, respectively.

Describing the name sought, the company explains that the hats are to be sold to women of 30, 40, perhaps even 50 years, women prominent in social and business life; and that for several reasons it has been considered inadvisable to call the new line by any appellation that includes the word matron. The slogan must not exceed 14 words.

All submissions should be in the hands of the judges not later than June 1, this year, addressed Dept. 64, Gage Brothers & Co., 18 S. Michigan Ave., Chicago.

INTERNATIONAL STAMP COLLECTORS PLAN LONDON EXHIBITION

Collections valued at thousands of dollars will be displayed at an international stamp exhibition in London during the month of May. Among the postage stamps which may be shown are some from a special issue recently brought out in Italy in conjunction with the tercentenary of the foundation of an institute of the Roman Catholic Church. These bear a picture of Christ in the midst of his disciples. It is believed that this is the only instance of philatelic representation of Jesus of Nazareth.

YEARLY BONUS OF £50 IS ADDED TO RHODES SCHOLARSHIPS

A yearly bonus of £50 will be added, until further notice, to the normal £300 per annum given to students holding a Rhodes scholarship. These scholarships, as many know, are tenable only at Oxford University, where they may be held for three years, subject to the approval of the school authorities.

To each state of the union are assigned two scholarships, though the actual nomination must first be made by the college or university of which the applicant is a member, and ratification is left to a committee of selection. The candidates must be male citizens of the United States, must be between 19 and 25 years, must be unmarried, and must have completed their sophomore year at some recognized institution. The Oxford University Press, American Branch, 35 West 32nd St., New York City, has on hand publications explaining the requirements in detail.

UNRECOGNIZED MUSICAL GENIUS SOUGHT BY NEW YORK MUSIC LOVERS

Unrecognized composers, vocalists, and instrumentalists who feel that they have exceptional ability, will be given an opportunity to prove their merit by the promoters of the stadium concerts at the College of New York City. This organization is holding a contest in which all American composers, singers, and players of musical instruments so desiring may have their talent passed upon. The winning composers will have their scores played by the New York Philharmonic Orchestra during the regular concert season, while the winners in the other groups will be permitted to play with the orchestra.

Manuscripts must reach William Cowen, chairman of the score committee, Fisk Building, New York City, before May 1, this year. Other conditions of the contest may be learned by writing the same address.

CASH PRIZES IN RECRUITING CONTEST FOR NEW YORK NATIONAL GUARD

Many members of the New York National Guard will be discharged upon the completion of their enlistment terms in the near future, and the adjutant general is taking the occasion for the inauguration of an active recruiting campaign, which, it is hoped, will aid in keeping the guard at its full strength. To further the campaign, cash prizes totaling $1,000 will be awarded to members throughout the state bringing in the greatest number of recruits, or securing the largest number of reenlistments. No distinction is to be made between the two classes of enrollment. Contestants, however, must themselves be members of the guard on or before March 31, this year, and must bring in their last candidate before June 15.

CIVIL SERVICE COMMISSION ANNOUNCES MANY GOVERNMENT VACANCIES

Vacancies for a radio engineer, associate radio engineer, and an assistant radio engineer, are announced by the Civil Service Commission. There are also positions open for a junior engineer and deck officer, an engineer, a senior engineer, Grade B, an associate, assistant, and junior engineer, a senior architect, and a topographic draftsman.

The salaries to be paid, closing date for applications, and other information may be had by writing the Civil Service Commission, Washington, D. C., for form 1312. Mention in the letter which position you are interested in.

STUDENTS OF MUNICIPAL GOVERNMENT INVITED TO SUBMIT ESSAYS

Postgraduate students who are enrolled, or who were enrolled last year, in any American college or university offering distinct postgraduate courses in municipal government, are invited by the National Municipal League to compete in an essay contest on the subject. The winning writer will receive $250, and the second best, $100. The same organization also announces a prize of $100 for the best essay submitted by an undergraduate student on any one of several stipulated phases of municipal government. For additional information, and instructions, write the secretary of the league, 261 Broadway, New York City, stating which contest you are interested in.

PERIODICAL ROOM MAY 1 8 1923 25 Cent

THOUSAND DOLLARS FOR WOMEN'S CLUB RENDERING GREATEST SERVICE

The women's club, affiliated with the General Federation of Women's Clubs, which in the 12 months ending Sept. 15, 1923, shall have rendered the service of greatest benefit to its community, will be given a prize of $1,000 by the Pictorial Review. In extending an invitation to the various clubs to compete for the prize, the editors of the magazine suggest that each send a typewritten report, accompanied by photographs. These reports must be in the hands of the magazine on or before the above-mentioned date. Additional information will be supplied by the Club Editor, Pictorial Review, 222 West 39th St., New York City.

BOYS AND GIRLS MAY WIN PRIZES IN SHORT-STORY CONTEST

Boys and girls, from 10 to 17 years of age, are asked to write stories for a joint prize contest to be held by The Haversack and The Torchbearer, 810 Broadway, Nashville, Tenn. Both in the boys' and in the girls' division of the contest, the stories must be between 2,500 and 3,000 words, and must be woven about a subject of general interest to either boys or girls. The winner in each group will receive $160, while other awards will be made to those placed second and third.

NATIONAL CONFERENCE ON STATE PARKS TO BE HELD FOR THIRD TIME

A national conference to discuss the development of state parks will be held at the Turkey Run State Park, Indiana, on May 7, 8, and 9, this year. This conference will be the third of its kind which has been called.

BOK PRIZE FOR COMMUNITY SERVICE GIVEN DR. RUSSELL CONWELL

Doctor Russell H. Conwell, journalist, pastor of the Baptist Temple, and head of the Temple University of Philadelphia, has been awarded the $10,000 Edward W. Bok prize for the most conspicuous service rendered to the community during the preceding year. The presentation was made by Senator George Wharton Pepper of Pennsylvania. Temple University, founded by Doctor Conwell especially for self-supporting young men and women, has both day and evening classes, and offers courses from the kindergarten to the highest university subjects. In addition to a school of pharmacy, a medical school, a law school, a dental, and a theological school, it gives instruction in commercial pursuits, civil engineering, physical training, domestic science, pedagogy, and music.

BOSTON TECHNICAL STUDENTS ASKED TO SOLVE CITY PROBLEMS

The city of Boston, through Mayor James M. Curley, is offering the students of the Massachusetts Institute of Technology, four prizes of $500 each for the best reports and working plans solving certain municipal problems. These include street traffic, street cleaning, and the sanitary control of offensive industries. The competition closes May 1, this year.

FOREST THEATER $100 PRIZE WON BY ILLINOIS WOMAN

The $100 prize offered by the Forest Theater of Carmel, Calif., for a play suitable for presentation on its outdoor stage, has been awarded to Helen Coale Crew (Mrs. Henry Crew), of Evanston, Ill., for a poetic drama of the 13th-century Italy, called "The Cradle." The story tells of Saint Francis and the children's crusade.

PRIZE OF $200 FOR HISTORICAL ESSAY ON EASTERN HEMISPHERE

A prize of $200 for the best monograph or essay in 1923 based on original investigation in the history of the eastern hemisphere, is offered by the American Historical Association. The manuscript must be written by a resident of the western hemisphere, and must not exceed 100,000 words. July 1, 1923, is the closing date. Address the secretary of the association, 1140 Woodward Building, Washington, D. C., for further particulars.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute. The Franklin medal is for workers in technology; the Elliott-Cresson is for original research work and invention; the Howard N. Potts is for important development of previous discoveries and inventions. Each award consists of a gold medal with a diploma. There are also a silver medal, and a Certificate of Merit awarded for meritorious discoveries, and cash premiums for certain work in optics.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France, Paris.

Best Treatise Regarding Immortality: Prize $1,000; announced January issue, 1923; closes Dec. 1, 1923; address, Contest Editor, 2 West 47th Street, New York City.

Awards to Further Science of Electricity: Medals and prizes, amounting in all to about $20,000; announced February issue, 1923. For particulars address General Electric Company, Schenectady, N. Y.

For Best Paper on Technical Phase of Aeronautics: Prize $125; closes March 31 of each year; announced February issue, 1923; address, Royal Aeronautical Society of England, 7 Albemarle St., London, W. 1, England.

For Best Work by American Chemist: An annual award of $25,000; announced February issue, 1923; address the Allied Chemical and Dye Corporation, New York City.

Articles on Chemistry: Prizes $50 and $25; announced January issue, 1923; closes May 1, 1923; address, Secretary, Canadian Institute of Chemistry, Toronto, Ont.

Names for Great Lakes Steamers: Two prizes of $50 each; announced February issue, 1923; suggested names must reach the company before the opening of navigation season in 1924; address the Detroit and Cleveland Navigation Company, Detroit, Mich.

For Best Studies in the Economic Field: Four prizes from $1,000 to $200; announced March issue, 1923; closes June 1, 1923; address, Prof. J. Laughlin, University of Chicago.

Literary Contest by the New Pearson's Magazine: Nine prizes totaling $1,500; announced March issue, 1923; closes May 1, 1923.

Motorboat Race, Miami Beach, Fla., to Havana, Cuba: Prizes $10,000; announced March issue, 1923. Write Miami Chamber of Commerce.

Essay on Economic Subject: Prize $1,500; announced March issue, 1923; address the Simonds Economic Prize Contest, 470 Main St., Fitchburg, Massachusetts.

Pulitzer Prizes, Columbia University: For best work in various literary and journalistic lines; announced April issue; nominations of candidates must be made before Feb. 1, 1924.

More Humane Slaughtering Devices: Two prizes, $10,000 and $5,000; announced April issue; closes April 30, this year; address, American Society for Prevention of Cruelty to Animals, 50 Madison Ave., New York City.

University Scholarship, Four-Year: For best high-school essay on "The Influence of Highway Transportation upon the Religious Life of My Community"; announced April issue; closes May 1, this year.

Scholarships for War Nurses and Ex-Service Men: Numerous scholarships provided at colleges and universities throughout the country under the will of the late La Verne Noyes; announced April issue; apply direct to colleges.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]